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ORNAMENTAL STREET LIGHTING.

The last meeting of the New York Section of the Illuminating Engineering Society, to which reference is made elsewhere, was devoted to discussion of display street lighting, such as is now popular among the merchants of wide-awake cities. From a decorative standpoint such lighting may be good, bad or indifferent, and appropriate or inappropriate according to the circumstances; but of one good thing the discussion bears witness in no uncertain terms, namely, that streets must be lighted, not in accordance with any principle of uniformity, but in a manner corresponding with their nocturnal importance. When the business men of a city are willing to go down into their pockets to some considerable depth for the purpose of supplying brilliant illumination on the chief business streets it is a clear indication that they realize the value and importance of lighting to a degree far beyond anything that is attempted by the ordinary municipality. One of the chief failings of American street lighting, in fact, has been the theory on which city governments have often implicitly, if not explicitly, worked; that, this being a country where all men are free and equal, all places where men live are therefore equal, and all streets on which they dwell must be lighted with an equal hand. Practically this doctrine has been affected by the superior pull in voters per acre, let us say, in the more densely settled portions of the city, but the result has been far short of an ideal distribution of light.

Now the merchants have taken the matter actively in hand, and experience seems to have shown that there is no better stimulus of evening business than brilliantly lighted thoroughfares leading to it. Business men are not apt to be influenced by theoretical considerations, but when the unerring application of the theory is driven home to them no class is quicker to act. The result of this activity has been in scores of cities the establishment of brilliant lighting on important business streets. The methods adopted have been as various as the taste of those active in the installations. Generally speaking, display illumination has been in the form of arches, of closely spaced clusters of tungsten lamps, or of brilliant and closely spaced arc lighting. The arch equipment is the most spectacular; it possesses the advantage of being cheap to install, but deteriorates rapidly. The incandescent cluster installation can be made attractive both by day and by night and affords a good distribution of illumination. Recent improvements in the arc lighting equipment render it a close competitor to the incandescent cluster equipment.

Just at present attention seems to have been diverted from the first mentioned to the last two, and this drift of practice seems a wise one; for, while arches can be made beautiful and effective, the installation generally fails to produce a

pleasing impression by daylight, which is a most important consideration. The reason is plain. The ordinary important street is 20 or 25 yd. wide and requires some degree of rigidity in the supporting structure for the arch of lamps. At night this structure drops out of sight and the effect may be very good, but by day it is unpleasantly conspicuous and, unless possessed of some grace and dignity of itself, may be positively obnoxious. It is extremely difficult to design a low arch of so considerable spacing, possessing any beauty in itself, without going to inordinate expense; and if the structure succeeds in a measure in producing a pleasing appearance, it is still by day apparently lacking in purpose until one observes the lamps.

Hence, in the interest of economy and of sound esthetics as well, the tendency toward lighting from closely spaced posts is a sound one. Many of these posts are of appropriate and dignified design, pleasing both by day and by night. Their failing, in most instances which we have noted, is lack of harmony with their surroundings. As a rule most cities which have gone extensively into display street lighting are relatively small, since business in the chief streets of the larger cities is not as a rule active after nightfall. The result is that one often sees ornamental posts of really excellent and decorative character, which would be admirably suited to boulevard lighting or to the courtyard of an important building, placed along streets where the business blocks are of the plainest and simplest character and in which a more harmonious and artistic result would be produced by less expensive and pretentious supports for the street lamps. Fortunately, growth in the incandescent-lamp business has tended to improve this situation. Two or three years ago people employed tungsten lamps of over 100 watts only with caution and some mental reserve, and were consequently driven to the use of clusters. At the present time admirable tungsten lamps are in production in sizes even up to 500 watts, so that it is now possible to employ a single big unit on a simple and graceful supporting shaft with very admirable effect and with materially increased efficiency of illumination. We are inclined to think that the use of such units, ranging from 250 to 500 watts, will increase, to the conspicuous betterment of display lighting and, what is more important, to its considerable extension.

Finally, the modern arc lamp is coming into use for this purpose with admirable effect. It has been tried in a simple form for several years past and in divers cities, but owing to the very general use of lamps with clear globes for this purpose the result has usually been somewhat glaring. The recent installation in New Haven puts an entirely different face on the matter, for here one has a powerful and properly shaded lamp borne on a post of very pleasing appearance and giving a wonderfully uniform and brilliant illumination not only on the street but on the façades of neighboring buildings. The result is very striking, and the efficiency of light production very much better, of course, than in the case of even tungsten lamps. Altogether, display street lighting is showing most gratifying signs of improvement all along the line, and the recognition of its value gives promise not only of its rapid increase but of a higher type of municipal lighting in the future.

THE CUSTODY OF DEPRECIATION FUNDS.

Although depreciation is now recognized in the accounting of many public-service companies, there are probably relatively few cases in which the depreciation fund is actually set aside independently of all other funds in such form as to allow it to be turned into cash quickly when needed for the replacement of worn-out or obsolete apparatus. The question of what constitutes proper care of a depreciation fund is of considerable importance. Some maintain that such a fund should be invested only in securities with a regular market value and thus salable at any time. Another view is that this fund can be invested as well in the company's own business, provided it be kept in such a way as will render it readily available when needed. It may be urged against the first plan that the investment of these funds in such a manner that they can be turned into cash quickly involves either their deposit with a bank or trust company at a nominal rate of interest or their investment in low-interest-bearing securities. Thus, it appears inconsistent for the company to be borrowing money at high interest on the one hand and loaning it at low interest on the other hand, unless there is some excellent excuse for so doing.

As a matter of fact, what actually occurs in the finances of many companies is something like this: The earnings are sufficient to provide an amount for a depreciation fund. The need of increased capital to meet the growth of business is urgent. The amount which should rightly be put in a depreciation fund is actually invested in additional plant. Now, there does not appear to be a fundamental error about such a procedure, because, by investing this money in additional plant, the company has increased its assets by an amount which offsets the corresponding depreciation in value. The weakness of the plan is that it does not definitely provide money which can be used for replacement. Therefore, what occurs is that, after putting surplus net earnings into additional plant for a number of years, the company effects a reorganization of some kind and issues additional securities equal to the additional value which has been put into the property from year to year. Part of these securities are then used to rehabilitate the property. The effect of this plan is that the cash which is necessary for renewals is secured by the sale of securities at the time of reorganization, instead of by the deposit of the surplus as a depreciation reserve from year to year and the sale of new bonds or stock to pay for the additions to the plant. In the meantime the company has had the use of its own money.

The chance of friction through this plan, especially under commission regulation of the issue of securities, lies in the possibility that the amounts spent out of the depreciation fund for enlarging the plant will not be recognized as an increase in assets against which additional securities may be issued when the company desires. The Massachusetts Gas and Electric Light Commission has decided that in order to keep a company's accounts properly it should pay for additions to plant by the sale of additional securities, rather than by taking the money out of net earnings. In cases where new securities are issued to pay for all increases in plant one course to pursue would be to invest the

depreciation fund of the company in its own securities until such time as the cash may be needed for replacements caused by depreciation, when they should be taken from the company's treasury and sold. If such securities can be sold promptly enough or used as collateral for a loan to provide against any embarrassment, such a plan should be sound. Whatever plan is followed, either voluntarily by the companies or by direction of the commissions controlling them, it is equally important that the amount set aside for depreciation and the amount expended in new plant should be distinguishable in the accounts.

COLD-WEATHER ADVANTAGES OF ELECTRICITY.

Electricity has the manifest advantages that it cannot be frozen and it cannot be adulterated. The former characteristic is particularly valuable during a long period of unusually cold weather, such as has been experienced over a large portion of the United States recently. Compared with gas, this superiority is really of very great importance. For instance, the gas company of Chicago declared in a public advertisement on Jan. 13 that during the preceding week it had received 7000 calls a day to thaw frosted gas pipes. The company also reported that it had 600 trained men on the streets employed in rendering the service necessary to remedy the trouble. All of this extra work was due to the unprecedented cold weather, the thermometer registering below zero for thirteen consecutive days and the ground being unprotected by snow during the first half of that period. Happily, electric service is free from this tremendous drawback. Most classes of electrical apparatus perform their functions even better, if anything, during cold weather than during warm weather. While the gas company in Chicago is thus compelled to apologize for delay in its "frosted-pipe" service, the electric central-station company not only does not suffer as the result of the cold weather, but has taken prompt advantage of it in its advertisements to show that by the use of electric fans steam radiators can be made much more efficient. In very cold weather it is often the case that the radiators are warm yet not hot enough to start and maintain a circulation of air. The result is that the air in a room remains stagnant and does not reach the radiator to be warmed. By directing against the radiator a current of air from an ordinary small electric fan placed on the floor, all the cold air in the room will become heated by contact with the radiating surface in a few minutes. One householder reports that he raised the temperature of a room 25 deg. Fahr. in half an hour by this simple method and without expending a greater amount of energy for heating, simply making the radiator more efficient by directing a constant stream of air against it. The use of electric fans to keep frost from forming on show windows of stores is a well-known and very practical winter application. It is also of interest to electrical men to observe that when very cold weather puts the gas range out of commission, owing to frosted pipes, electric-cooking utensils are suddenly in great demand. An electrical man in a northern Illinois town found his gas range useless the other morning when he got up, owing to the "freezing" of the pipes. With the aid of a coffee percolator and a toaster, supplemented by an electric flatiron, which did emergency service in an inverted position in cooking eggs, the family was able to make a very tolerable breakfast. In another case the electric flatiron was used to return into commission a frozen steam radiator. These facts show that the "cold spell" not only has no terrors for the electrical man, but rather emphasizes the desirability of what he has to offer.

MEASURING PERMEABILITY BY MEANS OF ALTERNATING CURRENTS.

There are three physical properties of iron that are of importance to the electrical engineer, namely, the permeability, the resistivity and the hysteresis coefficient. The second is of course variable with temperature, and the third is in many cases subject to some variation with long periods of time. When the iron to be tested is in the form of thin sheets or strips the resistivity is the easiest property to measure. The hysteresis coefficient is ordinarily measured by alternating-current methods, and the permeability by ballistic-galvanometer methods. Ballistic-galvanometer methods are essentially physical-laboratory methods and are much less adapted for factory use than alternating-current methods. Messrs. R. Beattie and H. Gerrard have published, in the London *Electrician*, as noted not long ago in the *Digest*, an article on a method of measuring permeability by alternating currents. Their preferred plan is to make a test ring of the sheet iron to be investigated and to supply a winding on this ring, from alternating-current mains, with sinusoidal voltage. On the assumption of sinusoidal impressed voltage on the winding, the flux density set up in the ring will be very nearly sinusoidal, and an electrostatic voltmeter connected to a secondary winding on the ring will enable the maximum cyclic value of this sinusoidal flux density to be computed without difficulty.

If the exciting current in the ring winding, taken from the mains, were sinusoidal, all that would be necessary to find the maximum cyclic magnetic intensity $\mathfrak{H}$ in the ring would be to measure the alternating-current strength in the exciting circuit by a correctly calibrated ammeter. The coincident values of $\mathfrak{B}$ and $\mathfrak{H}$ being then known, their ratio, the permeability, would at once be obtainable. But, as is well known, the exciting current of such a test ring is not sinusoidal, even although the impressed voltage is sinusoidal. Owing to the effects of hysteresis, the exciting-current wave will be distorted. This prevents the use of an ordinary ammeter in the exciting circuit from giving directly the maximum cyclic value of current and magnetic intensity. In order to find the maximum cyclic value of the exciting current, the writers resort to the ingenious device of inserting the winding of a small auxiliary iron ring in the exciting circuit. The power lost in this auxiliary ring depends upon the maximum cyclic value of the current. The auxiliary ring is, therefore, calibrated in advance for core losses at successive maximum cyclic exciting currents, and the core loss in the auxiliary ring is then measured by a suitable wattmeter, when the auxiliary ring is used in conjunction with the main ring under test. In spite of the ingenuity of the method, it is doubtful whether it will find favor in factory service; for the power expended in the auxiliary ring must be small, and a delicate reflecting wattmeter is therefore rendered necessary with it.

Award of Edison Medal to Mr. George Westinghouse.

At the meeting of the board of directors of the American Institute of Electrical Engineers held Friday, Jan. 12, the Edison medal committee reported that the Edison gold medal for the year 1911 had been awarded to Mr. George Westinghouse "for meritorious achievement in connection with the development of the alternating-current system for light and power." The report was accepted by the board and immediate publication of the award was authorized. The medal will be presented to Mr. Westinghouse at a meeting to be arranged later.

We take advantage of this opportunity to offer an apology to the Edison medal committee for the premature publication in these columns, in the issue of Dec. 2, 1911, of an announcement of the selection made for the award of the Edison medal. This was due to an account of the proceedings of the committee, intended only for the eyes of the members of that body, getting among editorial manuscripts and then being inadvertently considered as matter sent out for publication in accordance with the recent broad policy of the Institute in giving publicity to its affairs.

Mr. F. L. Hutchinson Appointed Secretary of the A. I. E. E.

At the meeting of the board of directors of the American Institute of Electrical Engineers held on Friday, Jan. 12, a resolution was unanimously adopted appointing Mr. F. L. Hutchinson to fill the unexpired term of the vacancy caused by the resignation of Mr. Ralph W. Pope, the appointment to be effective as of Jan. 1, 1912.

The resolution recited that the secretary of the Institute resigned on July 1, 1911, and that it is provided in the constitution that the vacancy in the office of secretary "shall be filled by the board of directors for the unexpired term. Such succession to office or appointment by the board of directors shall not render an officer ineligible for immediate election to the same office;" therefore, on the unanimous recommendation of the special committee appointed by the board of directors for the purpose of recommending a successor to the secretary, the vacancy was directed to be filled as above noted.

Annual Meeting of the Illuminating Engineering Society.

The annual meeting of the Illuminating Engineering Society was held in the Machinery Club, 50 Church Street, New York, on Jan. 12, following a dinner at which Dr. A. E. Kennelly, president of the society, acted as toastmaster. Seated at the speakers' table were Mr. B. R. Shover, of the Association of Iron and Steel Electrical Engineers; Dr. W. H. Tolman, of the American Museum of Safety; Prof. C. A. Martin, of the College of Architecture, Cornell University; Dr. A. C. Humphreys, of the American Society of Mechanical Engineers; Mr. Walter Cook, of the American Institute of Architects; Mr. Gano Dunn, of the American Institute of Electrical Engineers, and Mr. Ira C. Copley, of the American Gas Institute. Dr. Kennelly spoke of the function of the society, showing the exceedingly broad scope of the work falling to it. All of the other speakers brought greetings from their respective organizations and coincided fully with the desire for closer co-operation between the engineering societies as expressed in a recent letter from the I. E. S. signed by Dr. H. E. Ives. Each speaker in his turn outlined briefly some phase of the work of his society wherein co-operation with the I. E. S. would be very desirable. At the conclusion of the meeting Dr. Kennelly announced the result of the recent election as follows: President, Mr. Van Rensselaer Lansingh; vice-president, Mr. Norman Macbeth; general secretary, Mr. Preston S. Millar; treasurer, Mr. William J. Serrill, and directors, Messrs. A. J. Marshall, C. J. Russell and R. C. Ware.

MEETING OF THE ELECTRIC AUTOMOBILE MANUFACTURERS' ASSOCIATION.

The Electric Automobile Manufacturers' Association, which is composed solely of manufacturers of electric pleasure cars and has as its object the promotion of electric pleasure vehicles, held its first meeting since organization—other than meetings of its executive committee—at the Waldorf-Astoria, New York, on Jan. 11. The association, which was founded in Cleveland, Ohio, in September, 1911, is entirely distinct from the Electric Vehicle Association of America, and has twelve members at present, as follows: Argo Electric Vehicle Company, Saginaw, Mich.; Anderson Electric Car Company, Detroit, Mich.; Babcock Electric Carriage Company, Buffalo, N. Y.; Baker Motor Vehicle Company, Cleveland, Ohio; Broc Electric Vehicle Company, Cleveland, Ohio; Borland-Grannis Company, Chicago, Ill.; Columbus Buggy Company, Columbus, Ohio; C. B. Kimball Company, Chicago, Ill.; Ohio Electric Car Company, Toledo, Ohio; Rauch & Lang Carriage Company, Cleveland, Ohio; Waverley Company, Indianapolis, Ind., and Woods Motor Vehicle Company, Chicago, Ill. The officers of the association are: President, Mr. L. E. Burr, Woods Motor Vehicle Company; vice-president, Mr. R. C. Norton, Baker Motor Vehicle Company; treasurer, Mr. C. D. Firestone, Columbus Buggy Company, and secretary, Mr. F. H. Dodge, Ohio Electric Car Company. The executive committee consists of Messrs. H. H. Rice, R. C. Norton, C. L. F. Wieber, L. E. Burr and F. H. Dodge. The meeting, which was attended by fifteen representatives of the electric pleasure-car interests, was informal, its principal object being promotion of acquaintanceship among the members. Discussion of plans for mutual benefit, such as securing better recognition of the electric pleasure car at automobile shows as regards space allotment and formation of a show committee, constituted the only business features of the meeting. Meetings of the executive committee are held about once a month, the place of meeting being determined by the president of the association.

Boston Engineers' Club.

The third annual dinner of engineers practising in Boston and vicinity was held at the Hotel Somerset, Boston, on the evening of Jan. 15, about 400 being in attendance. The feature of the evening from the engineering standpoint was the announcement of the organization and incorporation of the Engineers' Club of Boston, at the culmination of nearly two years of work in behalf of the project, which is destined to encourage social intercourse among engineers and men interested in science and its applications and to improve the standing and usefulness of the technical professions by the maintenance of a scientific library and meeting place. The club membership is limited to 500 resident, 200 non-resident and fifty life members. Plans have been drawn for remodeling a house at No. 2 Commonwealth Avenue, which will provide most attractive headquarters within a few minutes' walk of the heart of the business district and within two blocks of the principal subway lines. It is expected that the premises will be ready for occupancy in the early fall. The officers are: President, Prof. Ira N. Hollis; vice-presidents, Mr. Charles L. Edgar and Mr. Charles T. Main; secretary, Mr. Luzerne S. Cowles, 101 Milk Street, Boston, and treasurer, Mr. Eliot Wadsworth. The board of governors consists, in addition

to the officers, of Messrs. Charles S. Clark, George B. Francis, Dugald C. Jackson, J. Henry Neal, Charles L. Gaguebin, Harry J. Horn, Leonard Metcalf, Frederic P. Valentine, Charles B. Davis and William A. Wood.

Annual Meeting of the Colorado Electric Club.

At the annual meeting of the Colorado Electric Club, held on Jan 11, General Irving Hale, Mr. J. F. Reardon and Mr. Benedict Schubart were elected directors to serve for a term of three years. The constitution was so amended as to increase the initiation fee from $2 to $5.

The president of the club, Mr. W. P. Carstarphen, gave a short résumé of the activities of the club during the year, which included two dances, a "floor day," a banquet in honor of the Mayor and an electric show. The membership increased from 308 to 403. Secretary Oehlman stated that for his $1 dues each member has received about $3 in benefits of various kinds. The total receipts for the year were $3255, the total expenses $1453, leaving a balance on hand for the year of $1802.

INDEPENDENTS SEEK TO HAVE GOVERNMENT BRING SUIT AGAINST BELL TELEPHONE COMPANIES.

Representing a number of Independent telephone operating companies in New York and Pennsylvania, Mr. John H. Wright, general manager of the Home Telephone Company, of Jamestown, N. Y., has written to the Attorney-General of the United States calling attention in a formal manner to what he alleges to be the facts in relation to the Bell telephone combination, consisting of the American Telephone & Telegraph Company and other companies. Mr. Wright's letter, which has been published in full in the newspapers, was dated Nov. 4, 1911. The writer says that the plain purpose of the Bell combination and each of its constituent companies is to eliminate free legalized competition from the telephone business. A long series of allegations is made to support this statement. It is said that the Bell combination wants to purchase a few pivotal Independent systems and by that means to force the stockholders of the remaining imporant Independent plants to sell out to the Bell interests. The property of the United States Long Distance Telephone Company, of Ohio, is cited as such a pivotal system.

Mr. Wright requests that an early effort be made by the Department of Justice to restore competition in the telephone business as essential to the protection of the public and the inventor. "The Bell conspiracy," said Mr. Wright, "should be stopped at its inception, not at its completion." It is said that a representative of the Department of Justice has been in Jamestown in conference with Mr. Wright, and it is possible that the government will take some action in response to the elaborate complaint laid before it by Mr. Wright, who says that he is acting on behalf not only of himself but of other stockholders in small competing telephone companies.

PROPOSED GOVERNMENT OWNERSHIP OF TELEGRAPH SYSTEM.

The United States Post Office Department has made public an official statement by Postmaster-General Hitchcock that he will recommend to Congress that the government acquire the telegraph lines of the country and operate them as a part of the postal system. This plan could be carried out in accordance with an act dated June 23, 1874, as follows:

"The United States may, for postal, military or other purposes, purchase all the telegraph lines, property and effects of any or all companies, acting under the provisions of the act of July 24, 1866, entitled 'An act to aid in the construction of telegraph lines and to secure to the government the use of the same for postal, military and other purposes,' or under this title, at an appraised value, to be ascertained by five competent and disinterested persons, two of whom shall be selected by the Postmaster-General of the United States, two by the company interested and one by the four so previously selected."

The Postmaster-General states that the separate maintenance of the postal and telegraph services under present conditions results in a needless expense. For example, in many small towns where the telegraph companies have offices the telegraph and mail business could readily be handled by the same employees.

It is not thought that the proposal of Postmaster-General Hitchcock meets with the approval of President Taft. The report of the Postmaster-General has not yet been presented to the President, who suggested that the matter be postponed when it was brought up in an earlier report. Thus far, however, he has neither directly approved nor disapproved of the plan proposed. The subject has been productive of much comment, those favoring it pointing to the advantages of governmental control of the postal system, and those opposing it pointing to the socialistic features of the movement. Mr. Clarence H. Mackay, president of the Postal Telegraph Cable Company, stated that the telegraph and telephone systems which would have to be taken over together are worth between two and three billion dollars and claimed that they would be operated by the government at a great annual loss, just as in Great Britain, where the losses on the telegraph alone up to date are estimated at $175,000,000.

Government Investigation of Amateur Wireless Interference.

An investigation of the extent of interference by amateur wireless-telegraph operators in the transmission of legitimate messages between ship and shore stations has been undertaken by the United States Navy Department. The immediate cause of the investigation was a delay of more than one hour in the transmission of messages of distress from the torpedo-boat destroyer *Terry* last week. During this delay the wireless-telegraph apparatus on the vessel was disabled and the exact position of the ship in distress could not be ascertained. It is estimated that at least 500 stations are in use and owned by amateur operators in the neighborhood of New York.

THE ELECTRIC VEHICLE IN BOSTON.

The increasing application of pleasure types of cars to the field of lighter commercial service was the principal topic of discussion by the Boston Electric Vehicle Club on Jan. 10. Mr. H. S. Knowlton, of Boston, occupied the chair during the business meeting. Remarks were made by Messrs. W. H. Francis, Converse D. Marsh, C. J. Hatch, P. E. Whiting, L. R. Wallis and others, special emphasis being laid upon the demonstrated fitness of the lighter types of vehicles to meet the conditions of business transportation as well as the requirements of the fair sex. The point was made that the electric vehicle is meeting many of the most severe conditions imposed in covering the extended territory of the Boston Edison company, which occupies an area of nearly 600 square miles. Representatives of the company stated that runs to the most remote

suburban points are constantly being made with electric machines owned by the company at a rate of speed which meets the demands of the day, and with great increase in comfort and reduction of fatigue formerly experienced by officials using gasoline cars. The latter advantage is particularly apparent in operating in the business center of Boston, where the flexibility and ease of control of the electric car are even more appreciated than in suburban runs. With the mileages now guaranteed the electric machine can be operated all day on a single charge.

Mr. Hatch stated that an excellent field for this type of vehicle exists in the contracting industry, where the time of executive officials is extremely valuable and where it is often necessary to visit several scattered jobs in a single half day. The consensus of opinion of those who discussed this phase of the subject was that the introduction of the electric machine into the contracting field is largely a matter of showing that the higher price of the electric car is justified by the great decrease in its depreciation and maintenance assured by its simplicity of construction. Long life is far more certain than with the gasoline outfit, and everything favors a low cost of operation. Mr. W. E. Eldridge stated that the Springfield (Mass.) Fire Department is considering the purchase of seven electric-vehicle equipments in addition to the four now in use. Mr. D. C. Tiffany cited the present use of an electrically driven fire-fighting equipment in the town of Hopedale, after about seven years of hard service in a hilly district. No one was able to cite any gasoline-driven machines of corresponding use which have lasted as long.

Mr. F. J. Stone presented some details of the electric-vehicle mart which is to be operated by the Public Service Electric Company of New Jersey to May 1, 1912. The use of the building, with heat, light, janitor service and electric signs, will be furnished free by the company to electric-vehicle manufacturers. The latter will place their cars on exhibition and supply their own attendants. Notice of the opening will be sent to 6000 representative families, while the circularization of 15,000 names will continue throughout the period of operation of the mart and 140,000 special notices will appear in the monthly statements of the company's customers. Mailing lists will also be furnished to the vehicle manufacturers. The building is located in the social center of Newark, directly opposite the newest and best theater in the city and in the same block with the leading café. In the ten months of operation of the company's automobile department 124 machines have been added to the list. It is expected that the opening of the mart will do much to increase the rate at which electric machines are being added in the company's territory. The next meeting of the club will be held on Jan. 24.

CLEVELAND CENTRAL-STATION SITUATION.

Mayor Newton D. Baker of Cleveland, Ohio, has begun his fight against the Cleveland Electric Illuminating Company along the same lines employed by his late friend, Mr. Tom L. Johnson. Last week he sent a letter to Mr. Samuel Scovil, vice-president and general manager of the company, in which it was asserted that the people by approving the bond issue of $2,000,000 had ordered the municipalization of the lighting industry, and that there are two ways in which this can be achieved, either by purchase on just terms of the property of the company or by the installation of competing plants. He, therefore, asks the company to sell to the city, but states that the city will purchase only such of the property as will be useful to it. A valuation could be easily arrived at, he states, and it would be better for all concerned to take this method of securing municipal lighting. Following these propositions, however, he adds that he proposes to develop the municipal system rapidly, the intimation appearing to be that if the company does not sell it will be driven from the field by competition.

In arriving at a valuation of the property and at just what portion of it the city should purchase, Mayor Baker suggests that an arbitration committee be formed by the selection of one member by the city and one by the company, with Mr. F. H. Goff, president of the Cleveland Trust Company, as the third member. Mr. Goff served as the representative of the Cleveland Railway Company in negotiations with Mayor Johnson, it will be recalled.

At a meeting of the Council committee on finance and appropriations on Thursday Councilman Haserodt suggested that Director of Public Service Springborn begin arrangements for a downward revision of the rates charged by the two small municipal plants. He said that the Council would take up the question of regulating the rates of the Cleveland Electric Illuminating Company soon, and he thought it only fair that the city should see to its own rates first and not ask the company to go below them.

In reply to Mayor Baker, Vice-president Scovil, of the Cleveland Electric Illuminating Company, said his company and its predecessors have for more than twenty-five years past been making continuous and large investments in its property with a view of having a permanent investment with a fair earning capacity secured to it by the furnishing of its service to its patrons at reasonable prices. The company, he said, has consistently refused to sell at various times, and has every confidence in the continued stability of its investment, expecting to make in the future, as in the past, a reasonable return thereon.

The administration has taken the reply to mean a refusal to negotiate. The annual meeting of the company will be held on Jan. 24, and this correspondence will be presented to the new board of directors after that.

Some days ago Mayor Baker announced the selection of Mr. A. B. Dupont as consulting engineer for the new municipal lighting project. The salary is reported to be $1,000 per month. Mr. Fred W. Ballard, for nine years chief consulting and constructing engineer of the Sherwin-Williams Company, has been selected as the engineer to build the plant, at a salary of $7,000 per annum. Mr. W. J. Critchley is the chief draftsman for the office.

Mr. Ballard, in an interview, said that the plant will supply service at a flat rate of 3 cents per kw-hour, and adds that the idea that the large consumer may have a lower rate than the small one in order to equalize the load on the plant is a fallacy, and that this has become a custom merely "because the other fellow does it." He expects the new plant to be completed in eighteen months.

The Cleveland Electric Illuminating Company does not appear greatly concerned because of all the announced preparations. Last week an application was filed with the Public Service Commission at Columbus for the expenditure of $2,793,818. Included in this is the cost of an office building on the site of the Lyceum Theater, on the Public Square, $339,350. In addition the company wants to spend $607,750 in the enlargement of its plant on the lake shore and $547,272 on underground cable and conduit. A proposed steam-heating plant at Euclid Avenue and East Fifty-fifth Street will cost $125,120. Some time ago the company asked for permission to issue $1,500,000 new stock and $1,500,000 additional bonds.

PENSION SYSTEM AND MUTUAL BENEFIT ASSOCIATION IN MILWAUKEE.

Announcement is made that The Milwaukee Electric Railway & Light Company and associated companies have established a pension system, loan fund and mutual benefit association, the arrangement going into effect on Jan. 1, 1912. Besides the company named, the plan affects the

employees of the Milwaukee Light, Heat & Traction Company, Milwaukee Central Heating Company, Racine Gas Light Company, Kenosha Gas & Electric Company and Watertown Gas & Electric Company. About 3500 persons are employed by these companies.

The pension system provides that any employee with a record of fifteen years' continuous service or more may be retired upon request at the age of sixty, with a pension for life. At the age of seventy any employee who has been in the service of the company for fifteen continuous years or more shall be retired with a pension for life. The pension is ascertained by multiplying the number of years of the employee's service by 1½ per cent of the average annual pay received during the last ten-year period of service, provided that the pension shall not be less than $240 a year nor more than $750.

By the establishment of a loan fund deserving employees may borrow money from the company to meet emergencies without paying interest. Payment is made in stated sums at each pay day.

The Employees' Mutual Benefit Association is to provide medical attendance and sick benefits and pay death losses of not less than $300. The initiation fee will be $1 and the dues 50 cents a month. The companies will contribute to this association an amount equal to that contributed by the employees and will in addition defray all the expenses of conducting the business except the fees of the physicians. The management of the association will be in the hands of trustees elected both by the employees and by the companies.

MAINTAINING ARC-LAMP SERVICE AT EQUITABLE BUILDING FIRE IN NEW YORK.

During the conflagration which destroyed the immense Equitable Building on Broadway, New York, last week one of the lamp-posts on the southwest corner of Broadway and Cedar Street was destroyed. The rapidity with which service was restored affords an instance of the difficulties oftentimes confronting electric-light companies in emergencies of this kind. The accompanying illustration shows the temporary arc-lamp support erected immediately after the regular post was destroyed, and gives some idea of the immense amount of ice encountered. It is worthy of note, also, that the arc lamps on the side streets and on Nassau Street were in regular operation, even though they were almost hidden by ice. The maintenance of this electric service was not only creditable to the New York Edison Company, but it aided the fire department in its work at night. The appearance of the building, covered, as it was, entirely with ice, was at once beautiful and awful by day, and at night the effect was heightened under the rays of the electric lamps.

Temporary Arc Lamp on Equitable Building Site.

ILLUMINATION OF ST. PATRICK'S CATHEDRAL IN HONOR OF CARDINAL FARLEY.

In conjunction with the celebration attending the return to New York of Cardinal Farley, on Jan. 17, St. Patrick's Cathedral, on Fifth Avenue at Fiftieth Street, was outlined in light. The scheme, as shown in the accompanying engraving, embraced all of the arches, buttresses, windows, doors and all of the horizontal and vertical lines, in addition to the two great spires, the crosses surmounting which tower 340 ft. above the sidewalk. Over the main entrance was outlined in colored lamps the coat-of-arms of the Cardinal, comprising a shamrock with two eagle heads on the left and two doves on the right. The lighting was planned by Messrs. C. R. Lamb and H. P. Poole, ecclesiastical architects, in consultation with officials of the New York Edison Company. The Elblight system was used extensively on the spires, and the steeplejacks intrusted with the work were provided with electric heating pads in order to protect them from the intense cold, electric circuits being maintained for this purpose.

St. Patrick's Cathedral.

It is estimated that approximately 27,000 8-cp lamps were required in outlining the building and some 20 miles of wire. A mile of independent low-tension feeders was run underground from the Edison substation at Fifty-third Street and Sixth Avenue to and around the cathedral to supply the energy. Surrounding the cathedral were arranged twenty-four five-lamp gilded tungsten standards equipped with 150-watt lamps. All of the switches of the decorative lighting circuits were closed on the evening of Jan. 17, and the entire lighting system was controlled from the Edison substation. By this means the illumination was brought up gradually, after the manner pursued at the Pan-American Exposition at Buffalo.

Special lighting was also arranged for the interior, the whole scheme within being radically changed. Forty-watt tungstens replaced the 2100 16-cp carbon filament lamps, and the seven great chandeliers, 130 ft. above the floor, five in the nave and one in each of the transepts, were lowered considerably. The lamps around the columns were also changed. The sanctuary illumination was modified to accentuate the beauty of the marble altar and reredos, the altar itself remaining untouched. This portion of the cathedral will be illuminated from lamps concealed behind the piers, while a chandelier will be placed over the vault where the archbishops are buried. The task of wiring the spires was exceedingly difficult, and the effect of the wind on the lighting circuits is evidenced in the photograph.

STREET LIGHTING.

At a meeting of the New York Section of the Illuminating Engineering Society held on Jan. 11 Mr. H. Thurston Owens, of New York, presented a paper entitled "A Résumé of Street-Lighting Conditions, with Special Reference to New York." The speaker outlined the four chief purposes to be accomplished by artificial street lighting as follows: The prevention of crime, the prevention of accident, the beautifying of the city, and increasing business. In New York, where there are 2000 miles of street, there are 80,400 lamps operated, at an annual cost of $3,170,000. Views were shown of typical street-lighting equipments in New York and elsewhere, both by day and by night.

Mr. G. S. Barrows, of Philadelphia, described various forms of high-pressure gas-lighting units suitable for illuminating streets. These units are operated at a pressure of from 2 lb. to 3 lb. They have not been introduced on a large scale in America, although installations containing not over eight lamps are to be found in several of the cities. Mr. Johnston, of Cleveland, described incandescent electric-lighting equipments suitable for street lighting. He stated that incandescent electric lamps were installed for street lighting in from 200 to 300 towns and cities during the past year. One of the notable installations is that of Warren, Ohio, which has been much advertised. In Niles, Ohio, which is not far distant from Warren, use will be made of attractive bronze posts, upon which will be mounted twenty-four five-lamp street-lighting equipments and sixty three-lamp standards. The author stated that the popular lighting standard is one arranged for five lamps, four of which are pendent. He claimed that the pendent position of the lamps is far preferable to the upright, from the point of view of the effectiveness of the illumination.

Mr. S. L. E. Rose, of Schenectady, described a recently introduced luminous-arc lamp equipment for use with ornamental posts. A description of this unit was given in our issue for Dec. 23, page 1525, as installed in New Haven, Conn. Use is made of the magnetite type of lamp, with the operating mechanism placed below the globe rather than above according to the usual construction. The life of the lower, or magnetite, electrode is from 150 to 170 hours, and that of the upper, or copper, electrode is from 3000 to 4000 hours. The lamp is designed to consume 6.6 amp at from 75 to 80 volts at the arc, and produces about 2000 cp.

Dr. Louis Bell, of Boston, remarked that the New Haven equipment represents a good, simple solution of the street-lighting problem. However, not all street lighting designated as decorative can be considered good. Much of it is built with a view to supposed economy, and the result has been a gaudy equipment. Decorative lighting equipments at the present time are in a process of evolution, and there are excellent reasons for believing that the final results will be highly satisfactory.

Mr. J. R. Cravath, of Chicago, called attention to the fact that a movement is on foot in Chicago looking toward the installation of 10,000 long-burning arc lamps. The original intention was to mount these lamps at an extremely low height, but, the attention of the city officials being directed to the inadvisability of a low mounting height, they will probably arrange to have the lamps hung at a height of, say, 30 ft. A recent test showed that more satisfactory results are obtained when the lamps are placed uniformly along one side of the street than when they are staggered along both sides of the street. This result is attributable to the much better uniformity of the light when lamps are on one side rather than on two sides. Moreover, where underground conduits are employed it is cheaper to place the lamps on one side.

Mr. Philander Betts, of Newark, N. J., consulting engineer of the Public Utility Commission of New Jersey, remarked that oftentimes a town will expend considerable money on decorative lighting in its more congested districts, while ignoring the absolute necessity for adequate lighting in the outlying districts in order to minimize crime.

Mr. H. W. Hillman, of New Haven, stated that in New Haven liberal use is made of both electric power and light. The 2000-cp luminous-arc lamps are placed at intervals of 88 ft. and staggered on opposite sides of the street. He stated that, although tests had not been made, the minimum illumination is probably 2 ft.-candles, which is very high according to street-lighting standards. He entered a plea for an increase in the use of light for all purposes. Mr. Frederick D. Adam, of New Haven, claimed that everyone in that city is pleased with the new lighting equipment and points to it with pardonable pride.

Mr. A. J. Marshall, as secretary of the section, announced that at the February meeting the general subject for discussion will be acuity. At the March meeting the general subject will be photography, a paper dealing with this subject being presented by Dr. Herbert E. Ives. At this meeting there will also be exhibited a kinemacolor process of producing motion pictures in nature colors. The April meeting will be devoted to the subjects of marine lighting and mine lighting.

METER DECISION IN MASSACHUSETTS.

The full bench of the Supreme Judicial Court of Massachusetts has issued a decision sustaining the Amesbury & Salisbury Gas Company in the case of the company versus C. J. Gibney, of Haverhill, the suit having been brought by the company to recover rent due on two gas meters which were located in the summer residences of the defendant. The company alleged that $10 was due for the year 1907 and $5 for 1908. The meters were of the coin-in-the-slot variety, and the gas could be turned on only by the insertion of a quarter-dollar, and the meters automatically shut off the gas when a certain quantity had flowed through them. In each of the years mentioned the gas company charged as "rent due" the amount of the difference between $7 per meter and the sum taken out of the meter during the year. Before 1907 the gas company had made no charge for the use of meters. Testimony was given for the company that

before the year 1907 it sent notice to every consumer who was furnished with slot meters stating that the company intended to "enforce the law allowing the gas company to get $7 from each consumer as a minimum, and that if that amount was not paid his meters would be removed and the supply of gas stopped." In the lower court the jury rendered a verdict for the company to the amount of the 1908 charge. The upper court says that the season for furnishing gas by the company to the summer resort did not exceed four months per year; that during the season of 1908 the company's meters for the use of which the action was brought were in the defendant's houses at his request; that before 1908 the defendant received due notice of the company's intended charge; that under the circumstances the defendant never expected to have the gas turned on except for the usual annual season of four months, and that he never requested the company to turn it on at any other time; that he made no reply to the company's communication nor asked the company to remove the meters, but actively used them in procuring gas for his use during the whole season of 1908 without making any protest whatever. The decision points out that as a natural inference from these findings the jury might further find that the defendant assented to the terms of the notice and that the meters were used by him in compliance therewith; that these terms entered into the contract between him and the plaintiff, and that, in accordance with the contract thus established, there were due to the plaintiff the sums named. The court also states that there is nothing in the Revised Laws (Chapter 58, Sec. 12), upon which the defendant relies, inconsistent with the making of such a contract.

ILLINOIS LEGISLATIVE INVESTIGATION OF REGULATION OF PUBLIC UTILITIES.

Considerable activity has been shown by the Illinois Legislative Public Utilities Commission, which is the name of the joint committee of senators and representatives of the Illinois Legislature appointed in May, 1911, to make a study of the subject of state regulation of public utilities with the view of advising the Legislature on the creation of a public-service commission in Illinois, which has been the object of a number of bills introduced in the Legislature. Notwithstanding the fact that the Legislature failed to make any appropriation for the expense of the investigation, the committee has gone ahead on its own responsibility, making trips to other states and to various portions of Illinois collecting information on the subject from all available sources. A clerk, an official reporter and a sergeant-at-arms accompany the committee, which believes that the Legislature will reimburse it for the outlay involved. The committee consists of five senators and five representatives, Senator John Dailey, of Peoria, being chairman.

The first public meeting was held in Chicago on July 13 last. After that the committee visited Madison, Wis.; New York City, Albany, N. Y., and Boston to familiarize itself with the methods of the public-service commissions in Wisconsin, New York and Massachusetts. The next tour was in the southwestern portion of Illinois, hearings being held in Cairo, Marion, Carbondale, Murphysboro, East St. Louis and Alton during the week of Nov. 13-17. City officials, managers of public-utility properties and others were invited to state their views at public meetings, and considerable interest was manifested. After the holidays the committee got an early start in the new year, and from Jan. 8 to 11, inclusive, it gave hearings in Carlinville, Springfield, Peoria, Bloomington, Decatur, Danville and Urbana. These cities are on the interurban electric lines of the Illinois Traction System, in the middle of the State, and the committee arranged for a private car and traveled in comfort, Mr. C. A. Willoughby, of Peoria, being master of transportation. The weather was extremely cold, however, and the itinerary was curtailed on that account. The last meeting was at the University of Illinois, but was very short, owing to the fact that half a dozen professors constituted the entire audience. Dean Kinley placed the resources of the university at the disposal of the committee and offered to draw up a memorandum on indeterminate or perpetual franchises, to which subject he has given some study. Senator Dailey said that the committee would be glad to have this assistance, but pointed out that in Illinois there might be constitutional objections to the perpetual franchise, and that the legal aspects of the question must be considered. The dean agreed to this and said that in the public-service-commission bill that he had drawn up, by request, and which was introduced in the Legislature about a year ago, the indeterminate franchise was omitted.

No more hearings will be held by the committee until spring probably. Then other Illinois cities will be visited, and the present plan contemplates a final public meeting in Chicago. The committee will report at the biennial session of the Legislature next winter. It may recommend that a public service commission be established, but it does not follow that this recommendation will be enacted into law, for the politicians from Chicago and other cities are apt to favor "home rule" for public-utility regulation, and they may muster sufficient force to defeat any bill that does not meet their ideas.

PUBLIC SERVICE COMMISSION NEWS.

NEW YORK COMMISSION.

The Public Service Commission, Second District, has granted permission to the Catskill Traction Company to construct an extension of its trolley line from Leeds to Cairo, a distance of approximately 7 miles, all in Greene County. When this line is built the Catskill Traction Company will operate a line of about 12 miles in length. The building of the extension was strongly opposed by the Catskill Mountain Railway, which parallels the authorized extension, upon the ground that the extension is unnecessary and that it will seriously damage the existing railroad property. Although the proposed extension track parallels the existing steam line between Catskill and Cairo, the steam line departs from the highway, and the proposed electric line would therefore serve the local traffic along the highway better than the steam line does, and, while the summer train service between Cairo and Catskill provided by the steam line appears to be adequate, the electric service through the winter would be a great convenience to the residents of this region. It is believed that the operation of the proposed trolley line by giving a regular and frequent service at low rates of fare and maintaining this service during the winter when the steam line discontinues operation would be a decided public convenience to the permanent residents in the locality and of value to the summer population. Before granting the application the commission required that the bond issue for this extension shall not exceed $80,000 par value, or $11,900 per mile. The balance, amounting to about $60,000, is to be supplied by issuing 6 per cent cumulative preferred stock to be sold at par. It is understood that this stock will be taken principally by local investors who are familiar with the business which it is proposed to develop by the new extension.

Hearings were continued Jan. 11 and 16 before Commissioner Maltbie, of the Commission for the First District, on the charges by stationary engineers in New York City that discriminatory rates are given by the New York Edison Company to large users of energy. At the hearing on the afternoon of Jan. 11 the auditor of the Edison company was again called and examined upon the annual re-

port of the company, and upon protests made by the company against special franchise assessments. He was examined on Jan. 16 upon the various costs entering into the total cost to the company of producing energy and upon the total returns from the sale of energy. The chief engineer of the Department of Gas and Electricity of New York was called Jan. 16 by counsel for the complainants, and this examination occupied the major part of the hearing. He was questioned upon the system used by the Edison company in bidding for city lighting upon the rates for city service and upon conjunctional service to city buildings within a 100-ft. radius from point of service entry. The next hearing is scheduled for Jan. 23.

NEW JERSEY COMMISSION.

The Board of Public Utility Commissioners of New Jersey had a number of matters on its calendar for the current week. On Jan. 16 the board continued at Trenton the hearing in the investigation of rates charged by the Public Service Electric Company. On Jan. 19 the board met in Jersey City to hear several complaints affecting telephone companies.

The board has approved the application of the Stone Harbor Electric Light & Power Company to issue $58,700 bonds and $21,000 capital stock, of which $5,000 is to be used for working capital and $16,000 for expenses in connection with organization, etc., from June 1, 1910, to Aug. 1, 1912.

The board has ordered the Riverside Traction Company to give free transportation to members of the township committee and the township clerk of Bordentown Township while traveling in the performance of their official duties. This was required by an ordinance of the township which had been accepted by the company, and it was the opinion of the board that this constituted an obligation which the company should fulfil.

The board has dismissed the complaint of Bordentown Township that the Riverside Traction Company refuses to carry school children at a reduced rate of fare, it appearing that there was no obligation resting upon the company requiring transportation at the reduced rate and that nothing was developed to show that the regular charge of the company is unreasonable.

MARYLAND COMMISSION.

The annual report of the commission shows that a total of 283 cases were disposed of during the year out of 390 cases filed. Of these ninety had a public hearing, an average of one every four days. Issues of stock and bonds by various corporations upon the authorization of the commission amounted during the year to $47,765,300, which brings the capital of public-utility companies under the supervision of the commission up to $1,772,578,669. This comprises investments in 280 corporations. The electric light and power companies are said to be in much more satisfactory conditions than are the gas companies. Hope is held out by the board that some satisfactory adjustment of the complaints in regard to the rates charged by the Consolidated Gas, Electric Light & Power Company may be made during 1912. A stricter and more positive definition of the commission's power is one of the principal pieces of legislation advised. Among the most important decisions of the commission was the recent telephone decision abolishing the flat rate to business houses.

MASSACHUSETTS COMMISSION.

The Boston Transit Commission has made public its seventeenth annual report to the City Council. The report reviews the progress made during the past fiscal year upon the Boston connection of the Cambridge subway, and includes much information of interest to engineers bearing upon traffic investigations in Boston proper. About $18,000,000 has been expended by the commission in subway work since its organization. In the near future the commission will build a two-track subway under the Back Bay from the Charlesgate district to Park Street by way of Newbury and Boylston Streets, and will extend the Cambridge subway to the South Station and thence to the vicinity of Andrew Square, Dorchester.

Massachusetts Legislative News.

A bill has been introduced providing that a corporation organized under the so-called business corporation law shall not, without legislative authority, own or control more than 10 per cent of the capital stock of a gas, electric light, heat or power company organized in the State.

Two bills have been filed providing for the electrification of steam railroads in the Boston metropolitan district, and it is anticipated that the vigorous campaign which was waged last year to secure this improvement will be carried forward with renewed energy at the present session. One bill, House Bill No. 127, provides for electrification within a 10-mile radius of Boston terminals by July, 1915, with the submission of plans in detail to the Railroad Commission by 1913. The other, House Bill No. 195, provides for electrification within the metropolitan park district by July, 1922, subject to the jurisdiction of the Railroad Commission.

Current News and Notes.

Boston Edison Section, N. E. L. A.—The first meeting of the Boston Edison Section of the National Electric Light Association for 1912 was held on Jan. 16. Mr. E. C. Kimball read an exhaustive paper upon "Handling Complaints," this being followed by a lantern-slide talk upon the "Recent Power Station Improvements of the Boston Elevated Railway Company," which was given by Messrs. C. W. E. Clark and E. N. Lake, of the Stone & Webster Engineering Corporation, Boston.

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New York Companies' Section, N. E. L. A.—At the meeting of the New York Companies' Section of the N. E. L. A. held on Jan. 15 Mr. T. C. Martin spoke on "The General Utility Company Employee, His Relation to the Company and to the Public." The meeting was also addressed by Mr. Franklin Matthews, who gave an illustrated lecture on the "Trip of the Atlantic Fleet Around the World." Mr. Matthews accompanied the fleet in its cruise as the representative of the *Sun*, of New York City, and his anecdotes and descriptions were most entertaining. The program concluded with music and refreshments as usual.

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Boston Electrical Luncheon Club.—Great enthusiasm was the characteristic feature of the meeting of the Luncheon Club Branch of the New England Section of the National Electric Light Association at Boston on Jan. 19. By Wednesday night, nearly two days before the meeting, over 200 acceptances had been received at the office of the secretary. The program consisted of five-minute talks by President C. L. Edgar of the Boston Edison company and Messrs. C. B. Davis, G. M. Bates, H. B. Gilmore, F. A. Houston and E. K. Hall. For the present the luncheon meetings will be held every Friday at 12:30 p. m. It is expected that these meetings will do much to develop a co-operative spirit in the electrical fraternity.

ELECTRIC CLUB OF CHICAGO.—At the meeting of the Electric Club of Chicago on Jan. 10 President Niesz announced a nominating committee, consisting of Messrs. A. L. Millard, Robert S. Mitten and W. R. Bonham. Messrs. J. R. Cravath, H. W. Fowzer and H. B. Otis were appointed judges of election.

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ELECTRIC VEHICLE ASSOCIATION OF AMERICA.—At the regular monthly meeting of the Electric Vehicle Association of America, which will be held in the Engineering Societies Building, New York City, Jan. 23, Mr. H. E. Pratt, of the Gould Storage Battery Company, will present a paper entitled "The Storage Battery Car."

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INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS.—The sixth triennial congress of the International Association for Testing Materials will be held in the Engineering Societies Building, New York, beginnning Sept. 3, 1912, under the patronage of the President of the United States. The 1909 congress was held in Copenhagen. A number of distinguished foreign scientists and engineers are expected to attend.

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MINNEAPOLIS' ELECTRICAL NEWSPAPER PAGE.—Following the co-operative advertising plan originated by Mr. M. E. Turner, of Cleveland, Ohio, and later extended to other cities, Minneapolis now has a weekly electrical page in the Sunday *Journal*. The text includes items of electrical interest, and the advertisers are local electrical houses, led by the central-station company, which employs a large display space.

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"OVERCOAT" STORAGE BATTERIES.—From an inquiry received we learn that a reference in our editorial on page 15 of our issue of Jan. 6 to a type of battery, designated therein as the "overcoat" type, may be suspected as implying criticism of a well-known commercial storage battery. This surmise would be incorrect, as the reference is to proposed batteries which had come under the observation of the writer of the editorial and which have not reached the commercial stage.

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FINANCIAL AND ENGINEERING FEATURES OF WATER-POWER DEVELOPMENT.—Mr. C. E. Freeman, consulting engineer, Chicago, addressed the Armour Branch of the American Institute of Electrical Engineers at the Armour Institute of Technology, Chicago, Jan. 10, on the subject of "Financial and Engineering Features of Hydroelectric Development." Mr. Freeman outlined the general plan of making a hydroelectric development, beginning with the work of promotion, financing, engineer's report of feasibility, commercial profit, etc., and closing with detail plans of plant layout, construction and operation. The speaker also touched on the matter of federal permits for powers on the public domain.

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EMERGENCY SERVICE FOR WATER-POWER PLANT.—Owing to the formation of an ice gorge in the Illinois River during the recent severely cold weather the operation of the hydroelectric plant of the Marseilles Light & Water Power Company, of Marseilles, Ill., was interfered with. Assistance was obtained, however, from the Public Service Company of Northern Illinois, which transmitted from its generating stations at Streator and Joliet about 500 kw, connecting with the Marseilles company's lines at Morris. This energy was supplied at 60 cycles and transmitted from Morris to the hydroelectric plant at Marseilles, where it was changed to 25-cycle energy through a frequency changer and supplied to the Marseilles company's system.

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NORTHWESTERN ELECTRICAL EXPOSITION AT MINNEAPOLIS.—As already noted in these columns, the 1912 Northwestern Electrical Exposition is to be held in the Minneapolis (Minn.) Armory during the week of March 16 to 23. During the same week the Minnesota Electrical Association will hold its annual convention, and meetings are scheduled for the local A. I. E. E. section and other electrical organizations. "The electrical exposition, a modern education," has been adopted as the slogan for the show itself, and to further this idea a design has been prepared for a stamp for use on outgoing mail matter from the Twin Cities. A feature of the 1912 show will be the number of electric vehicles exhibited. Fourteen manufacturers have already contracted for space, and it is expected that the electric-car exhibits, in addition to those of the rectifiers and storage batteries, will be the largest ever devoted to electric transportation in the West. Prizes up to $20 will be offered for the best exhibits of electrical apparatus constructed by students. Mr. R. W. Clark is manager of the exposition.

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WOOD PRESERVERS IN CONVENTION.—The eighth annual meeting of the Wood Preservers' Association was begun in the Hotel Sherman, Chicago, on Jan. 16. President John T. Logan, of Texarkana, in a brief address, said that the association, which is a unique scientific organization, is growing rapidly in numbers and influence. The association is the court of appeals on all subjects relating to wood preservation. Secretary F. J. Angier, of Baltimore, reported 104 members at the close of 1911, an increase of 60 per cent. A letter from Mr. Howard F. Weiss, of Madison, Wis., brought out the fact that the association is co-operating heartily with the United States Forest Service in the work of the latter in preparing bulletins on the preservation of poles, ties, piling and other wooden structures. The matter of sending a delegate from the association to the International Congress for Testing Materials to be held in New York next September was referred to the executive committee. The first session was adjourned early as a tribute to the memory of Charles D. Chanute, who, like his father, the late Octave Chanute, was a prominent figure in the science and art of wood preserving. Mr. W. F. Goltra, of Cleveland, delivered an eloquent eulogy having Charles D. Chanute for its subject.

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CO-OPERATIVE SCIENTIFIC INFORMATION BUREAU AT BOSTON.—As a result of a demonstrated need of improved methods of interchanging technical data and experience, an organization to be known as the Boston Co-operative Information Bureau was established at the Massachusetts Institute of Technology on Jan. 10. The bureau will act as a clearing house of special knowledge and is designed to facilitate the acquisition of information which is ordinarily more or less difficult of access. The advantages will be of particular interest to engineers and other workers in applied science, and it will in many cases afford an opportunity to consult publications which are of too highly specialized character for circulation in public libraries, as well as being a means of putting specialists of various kinds in touch with one another. Members will be of three kinds—co-operating, who are expected to submit to the bureau, as far as is practicable, a statement of their specialties or of the literature they are prepared to loan on occasion; subscribing members, who will receive a monthly bulletin in return for nominal dues, and full members, who are both co-operating and subscribing. Among the organizations which have agreed to co-operate are the Massachusetts Institute of Technology, the Harvard University Library, the Public Works Department of the city of Boston, Stone & Webster, the Crocker-Wheeler Company, the library of Congress, and the United States Departments of Commerce and Labor and of Agriculture. Mr. R. P. Bigelow, librarian of the Massachusetts Institute of Technology, is president of the bureau, the secretary and treasurer being Mr. G. Winthrop Lee, librarian for Stone & Webster, Boston.

North Carolina Sons of Jove.—A rejuvenation of the Sons of Jove will be held at Raleigh, N. C., at which prominent officers of the order will be present and about fifty candidates admitted to membership.

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Idaho Cedarmen's Association.—At the annual meeting of the Idaho Cedarmen's Association, held in Spokane on Jan. 8, the retiring officers were unanimously re-elected as follows: Mr. P. C. Lindsley, president, and Mr. H. C. Culver, secretary-treasurer. The association is planning to co-operate with the government in making tests as to the strength of the various species of cedar used for poles carrying electric wires.

* * *

New England Section, I. E. S.—A meeting of the New England Section of the Illuminating Engineering Society will be held on Jan. 22 in the auditorium of the Edison Electric Illuminating Company of Boston, 39 Boylston Street. Three papers dealing with the employment of incandescent electric lamps to produce artificial daylight are scheduled, the papers being respectively by Messrs. H. E. Ives, R. B. Hussey, and C. H. Sharp and Preston S. Millar.

* * *

Papers for New England Convention.—The following titles of papers to be read at the March convention of the New England Section of the N. E. L. A. have been announced: "The Use of the Electric Vehicle in New England"; "Load-Factor and Power-Factor, and How to Improve Them"; "The Exhaust-Steam Turbine as Applied to Electric Lighting." There will be a report of the rate committee on the general subject, and a discussion of the question "Should the Central Station Maintain a Wiring Department?"

* * *

Chanute Medal Awards for 1910.—At the dinner of the Western Society of Engineers, Chicago, Wednesday evening, Jan. 10, announcement was made of the award of the Octave Chanute Medal for 1910 in electrical engineering to Mr. H. B. Gear, general inspector of the Commonwealth Edison Company, Chicago, for his work on "devices for the distribution of electric light and power." Mr. C. P. Berg received the medal for mechanical engineering in the heat treatment of high-speed tools, and Mr. C. K. Mohler was awarded that in civil engineering for his studies of earth pressures.

* * *

Western Society of Engineers.—At the forty-second annual meeting and dinner of the Western Society of Engineers, held at the University Club in Chicago on Jan. 10, the result of the recent election of officers was announced as follows: President, Mr. W. C. Armstrong; first vice-president, Mr. A. Bement; second vice-president, Mr. G. T. Seely; third vice-president, Mr. E. C. Shankland; treasurer, Mr. A. Reichmann; trustees, Messrs. W. W. Curtis, E. McCullough, J. G. Giaver. Secretary J. H. Warder gave a brief report of the year's work, and there were speeches by the retiring president, Mr. O. P. Chamberlain, and the incoming president, Mr. Armstrong. Addresses on "Citizenship" were made by Dr. W. M. F. Goss, of the University of Illinois, and Judge Marcus Kavanagh, of Chicago.

* * *

Commonwealth Edison Employees Express Their Thanks for Service-Annuity System.—The employees of the Commonwealth Edison Company of Chicago expressed their thanks to the company for giving them a service-annuity system for a Christmas present by presenting an illuminated address to the president and board of directors of the company. This address is handsomely bound in ooze and contains the following message, illuminated in gold and colors: "To the President and the Board of Directors of the Commonwealth Edison Company of Chicago, Illinois: The employees of the Commonwealth Edison Company desire to express their sincere appreciation of the generous, stimulating and helpful action of the company in establishing the service-annuity system announced under date of Dec. 23, 1911, and extend to the president and board of directors of the company their best wishes for a happy and prosperous New Year. Chicago, January 1, 1912." This statement is followed by the signatures of 2775 employees of the company. In order to present the address immediately after New Year's, less than five days was available to secure the signatures, and in this time over 81 per cent of the 3400 employees signed the testimonial.

* * *

The Inventor in His Hours of Ease.—Mr. Thomas A. Edison is the most kindly and considerate of men, as those who have visited him at his Orange laboratory can testify. Not infrequently the inventor imposes on his own convenience and time for the benefit of some caller hardly entitled to monopolize the valuable minutes of his busy days. At the close of the recent Byllesby dinner in Chicago, where Mr. Edison was a guest of honor, someone asked him for his autograph on a menu card. It was then after midnight, but the distinguished visitor turned to a nearby table, seized a blue pencil that was offered him, and for the next thirty minutes, without looking up, signed programs as fast as they were pushed before him by those who crowded about. Mr. Samuel Insull, president of the Commonwealth Edison Company and Mr. Edison's old-time employee and friend, finally became a little impatient at the delay and asked the inventor if he was yet ready to go to his hotel, the Blackstone. Without glancing up from his autograph signing, Mr. Edison shook his head and Mr. Insull made as if to move off. He had gone but a few feet when the wizard of Menlo recollected himself and shouted, "Hey! who's going to see me to my hotel?" Mr. Insull replied with feigned indifference, "Oh, I suppose Mr. Ferguson will go with you when you are ready." "All right! good night," returned Mr. Edison cheerily, as he smilingly applied himself to inscribing his characteristic autograph on the menu belonging to one of his host's youngest clerks.

* * *

Minneapolis Electric Club.—Nearly 150 men attended the Jan. 8 meeting of the Minneapolis Electric Club in the new assembly room provided by the Minneapolis General Electric Company on the fifth floor of the company's enlarged office building at 15 South Fifth Street. The president of the club, Mr. F. G. Dustin, announced as a committee to arrange for the club's annual banquet in February Messrs. H. J. Gille, chairman; Charles W. Arrick, Emil Anderson, Frank O. Wallene and Maurice T. Moss. Mr. Gille was also designated to serve as toastmaster at the dinner, for which covers will be laid for about 300. Mr. MacMartin, of the MacMartin Advertising Company, of Minneapolis, gave an interesting talk on co-operation in advertising, and was followed by Mr. T. A. Cressey, of the Chicago office of the Electric Storage Battery Company, who read a paper on commercial and pleasure electric vehicles. The latter pointed out the advantages of electric-vehicle transportation for urban delivery, its promptness, speed, cleanliness, cheapness, etc. The electric vehicle, he said, requires the minimum of repairs and is an all-the-year-round car, giving the greatest service in actual hours' use and miles per year. A number of Twin City electric-vehicle men were present and took part in the discussion which followed. Mr. R. W. Clark, manager of the electrical exposition, next spoke of the progress in his plans for the exhibition to be held in Minneapolis March 16 to 23, and declared that the electric-vehicle and battery exhibit will be one of the largest in the Northwest, seventeen spaces having already been reserved for these displays. He also told of the elaborate lighting and decorative effects planned for the coming exposition.

110,000-VOLT TRANSMISSION SYSTEM OF THE PROVINCE OF ONTARIO—III.

Transformer Station at Niagara Falls, Interswitching Station at Dundas, Stations at Toronto and Other Cities, and Operating Routine.

THE two previous articles on the work of the Hydro-Electric Power Commission of Ontario have described the transmission system up to the distributing stations, or, in other words, all of the 110,000-volt line work. The present article is devoted to the design and layout of the various stations, including the step-up transformer station at Niagara Falls, Ont., the interswitching station at Dundas, and the transformer stations receiving high-tension energy from the commission's lines. The concluding article will describe the low-tension distribution work of the Hydro-Electric Power Commission of Ontario, consisting chiefly of 13,200-volt lines connecting the municipalities to the substations. In some cases these lines are operated at a potential of 6600 volts.

NIAGARA FALLS STATION.

Power is received at the Niagara Falls station, which is shown in Fig. 24, from the Ontario Power Company's distributing station at 12,000 volts pressure over three-conductor, 300,000-cm, paper-insulated, lead-sheathed cables placed in tile conduits. Each of these cables is capable of carrying 4500 kw, and since each transformer bank has a capacity of 9000 kw it is essential that each pair of incoming power cables be connected in parallel to supply a transformer bank. Both ends of each pair of cables are protected by an automatic oil circuit-breaker. The oil switch at the end of the cable is connected with an auxiliary bus, which in turn is connected by similar breakers to a main bus, or directly to a bank of transformers.

Fig. 24—General Elevation of Step-Up Transformer Station at Niagara Falls, Ont.

At present there are nine 3000-kva single-phase transformers installed (Fig. 27), although the building has been made large enough to contain an additional bank of three. From the high-tension side of the transformers the current is carried through disconnecting switches and high-tension oil switches to the high-tension busbars; then through disconnecting switches and oil circuit-breakers to the line outlets of the two outgoing 110,000-volt lines (Fig. 25). From here it passes through choke coils and electrolytic arresters with horn-gaps placed outside to the line.

The 12,000-volt switches, busbars and accessories are located in the basement. The incoming feeder cables are laid in ducts beneath the basement floor, the necessary number terminating at the terminal compartment opposite each feeder switch. In other parts of the basement are the heating boilers, oil tanks, storage battery, pumps and air compressor. The two cables for feeding each switch terminate in a terminal room with standard end bells, above which the sets of leads are tied together. The leads from the transformer oil switches pass up through the floor to the transformers, where the potential is stepped up to 63,500 volts, single-phase. Each feeder is equipped with three oil circuit-breakers, the first connecting the power source to an auxiliary bus, the second the auxiliary bus to the main bus, and the third the auxiliary bus to a bank of transformers. By this arrangement a feeder with a capacity equal to that of a transformer bank may be connected directly to a transformer bank or to the main bus. Through the medium of the auxiliary bus a transformer bank may also be connected to the main bus. This arrangement, while not complicated, permits of sufficient flexibility, since there are always two oil circuit-breakers in series. The feeder switches are each equipped with inverse time-limit relays, each transformer switch having a definite time-limit relay, while the bus switches are non-automatic. Disconnecting switches are supplied on both sides of each oil switch. The oil switches are electrically controlled from a switchboard located in the control-room. Colored lamps are employed to indicate switch conditions to the operator.

A service oil switch for controlling the transformers for the lighting, mechanical and other station equipment is connected to the main 12,000-volt bus. All 12,000-volt connections, busbars and switches are inclosed in concrete cells. The transformers and high-tension switches are located on the main floor and separated by a brick wall 15 ft. high. Transformer banks are separated by a brick wall 25 ft. high. A track runway is provided to facilitate the removal of the transformers to the erection room for inspection or repairs. The piping subway is beneath the transformer compartments. The oil, water and air pipes pass through the floor immediately in the rear of the transformers to the piping mains. The transformers are connected in delta on the low-tension and in star on the high-tension side, with a grounded neutral through a water resistance. These nine 3000-kva transformers are shell-type, oil-insulated and water-cooled. They are designed for operation on 12,000 volts low tension, 110,000 volts high tension, and are equipped with the Westinghouse condenser type of bushing.

Each transformer and high-tension line is connected to a bus by an automatic three-pole oil circuit-breaker. These breakers are controlled from the control gallery in a manner similar to the 12,000-volt oil switches. In general the oil switches are isolated by means of disconnecting switches with blades normally vertical, mounted on post insulators, supported on the walls. All 110,000-volt connections and

buses consist of bare 1-in. seamless copper tubing supported on porcelain petticoat insulators, of the built-up post type, with an over-all height of 39 in. The buses are installed near the roof and supported on special steel structures. They run the entire length of the high-tension switch-

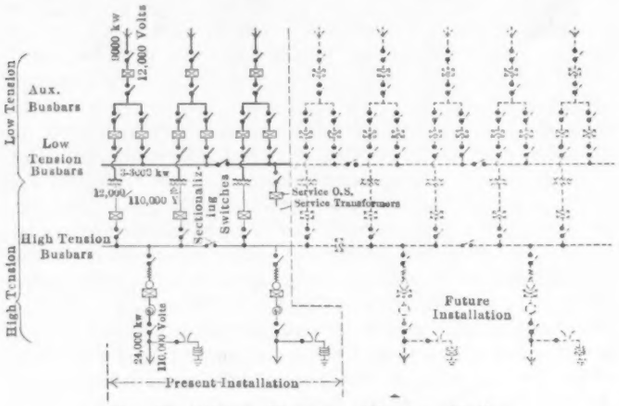


Fig. 25—Wiring Diagram, Niagara Station.

room. A minimum clearance of 6 ft. between phases and 3 ft. 6 in. between a conductor and ground is maintained. The five 110,000-volt, three-pole circuit-breakers are electrically operated and equipped with Westinghouse condenser-type bushings. Owing to the design of the switch no concrete barrier or brickwork is required. This type of switch will automatically open by gravity should an accident occur to the mechanism.

The line outlets consist of corrugated porcelain tubes 40 in. long, supported in a horizontal position by four porcelain posts mounted in the plane of the wall in a treated wooden frame 5 ft. square, the intervening space being filled with plate-glass.

The hoods protecting the outlet bushings from the weather are 8 ft. wide and extend 3 ft. below the level of the bushing. On leaving the porcelain the leads drop vertically to a post insulator beneath the hood, from the top of which the cable is carried directly to the insulator on the arrester structure. A choke coil constructed of solid aluminum wire in the shape of a helix with porcelain separators between the adjacent turns is placed beneath the wall outlet and this insulator. For lightning protection two sets of electrolytic lightning arresters are employed. These are equipped with horn-gaps and are placed on special steel structures outside the building, the aluminum plates being immersed in boiler-iron tanks filled with oil.

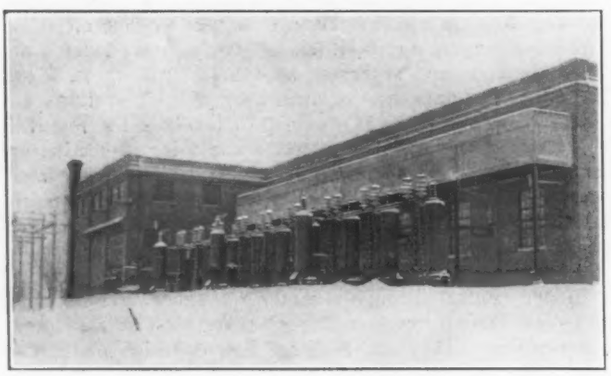


Fig. 26—Dundas Station, Lightning Arresters Covered with Snow.

Two switchboards are located in the control-room. The main board consists of three 28-in. slate panels. Each panel controls one incoming feeder, the two connected 12,000-volt switches and one transformer bank. Two of the panels, in addition, control the outgoing high-tension lines. Mimic bus connections and the indicating lamps on the board assist the operator. The recording meters are placed on panels in the rear of the main board. The second switchboard is used for station service. It controls the

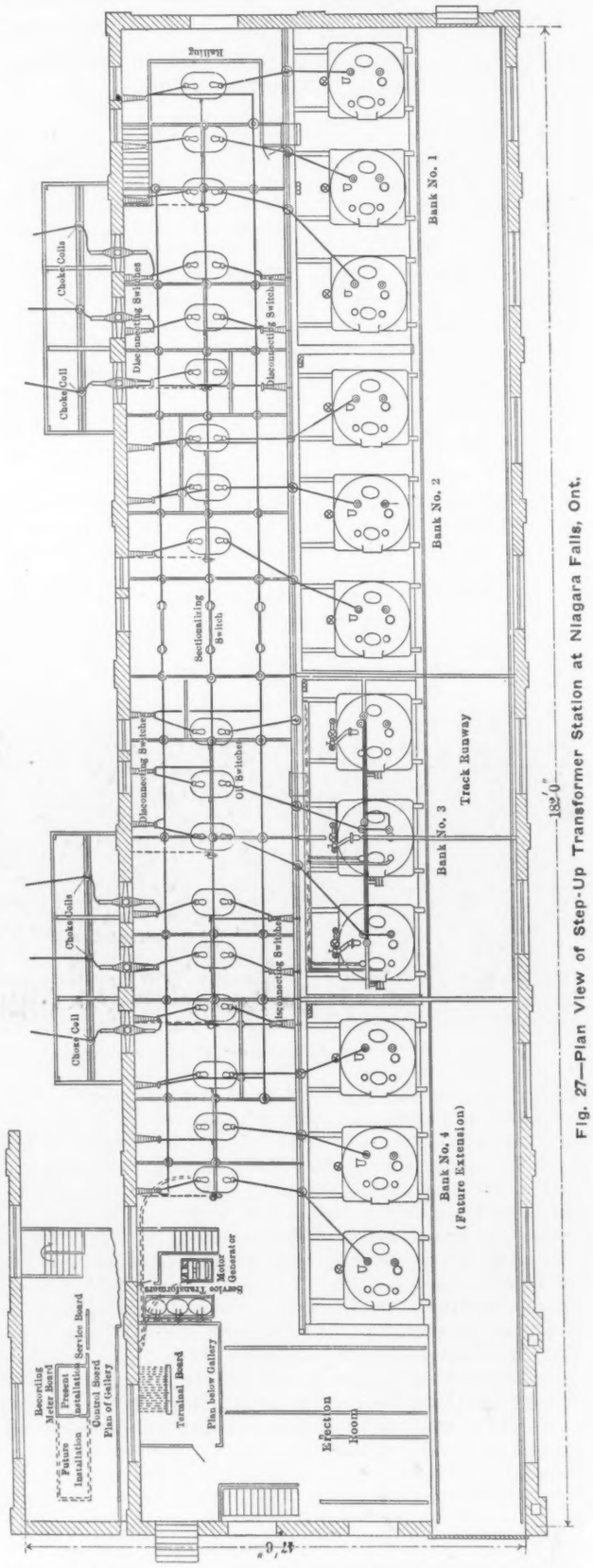


Fig. 27—Plan View of Step-Up Transformer Station at Niagara Falls, Ont.

main lighting, the motor generator, the battery charging, the crane, the battery and pump circuits. The lighting is done by means of incandescent lamps connected to three

phases of the 110-volt station circuit. Every third light is wired in such a way that by means of a no-voltage release switch on the service switchboard these lamps are thrown over to the battery circuit in case the alternating-current power is off.

The water for cooling the transformers is obtained from the city of Niagara Falls, and from the Ontario Power Company if the city supply should fail. The water, having passed through the transformer coils, is carried to a sprinkler cooling tank. This is an open concrete basin, 6 ft. in depth, in two sections each 30 ft. by 60 ft., with the surface just above the ground level. The water is delivered to the basin through sprinklers some distance above the surface and in falling about 8 ft. over screens is cooled by contact with free air. Duplicate motor-driven turbine pumps are installed for operating this system.

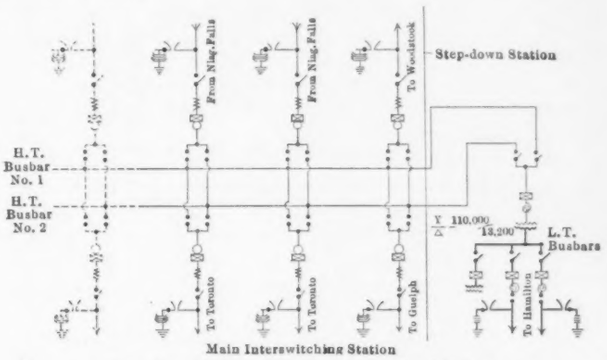


Fig. 28—Wiring Diagram, Dundas Station.

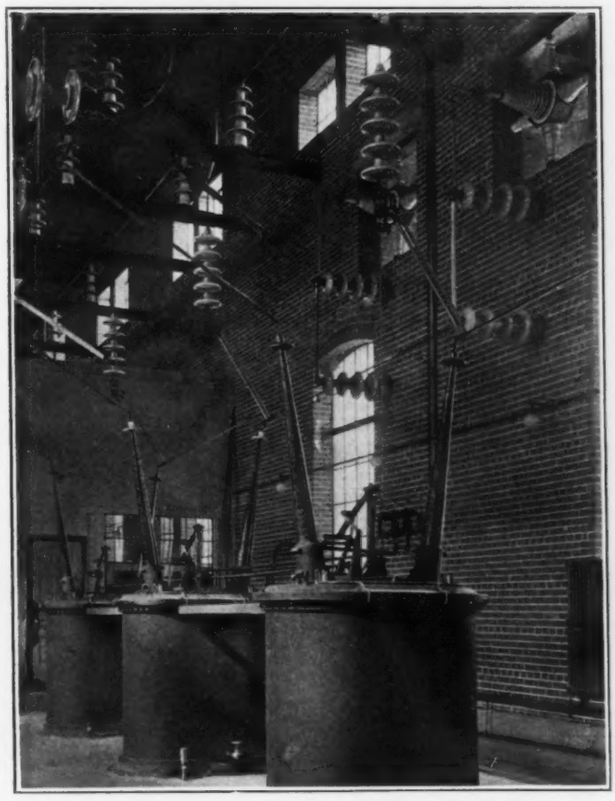


Fig. 29—110,000-Volt Breaker Unit, Dundas Station.

Duplicate oil tanks are installed in the basement, the volume of each being slightly greater than the oil volume of one transformer. The transformers are provided with oil blow-offs at their tops piped to a main running into the "bad" oil tank. This tank is provided with an oil sealed blow-off and a valve at the bottom to a drain. An oil filter and drier is installed between the tanks. The oil, after filtering, is pumped back into the "good" oil tank. An oil pump is also provided for pumping pure treated oil to an "intermediate" oil tank placed on the main floor at such an elevation that the oil may be drawn into any of the transformers by exhausting the air from the cases. A motor-driven air compressor and vacuum pump is piped to the different transformer cases. This can be operated as a vacuum pump for drawing oil into the case or as a compressor for pumping in air to assist gravity in emptying the case. The high-tension oil-switch tanks are connected by pipes to a switch oil tank in the basement, which is also connected to the oil filter.

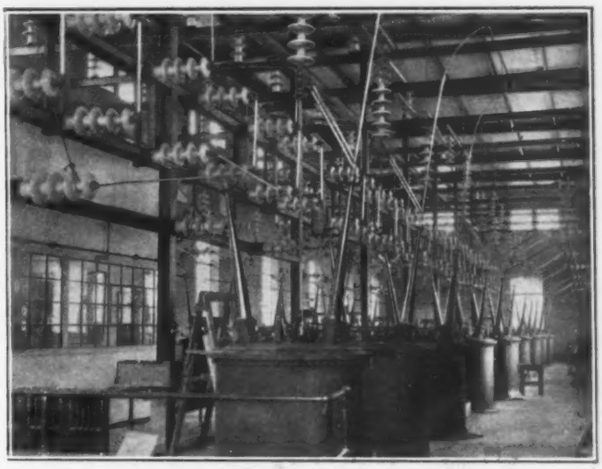


Fig. 30—High-Tension Room, Dundas Station.

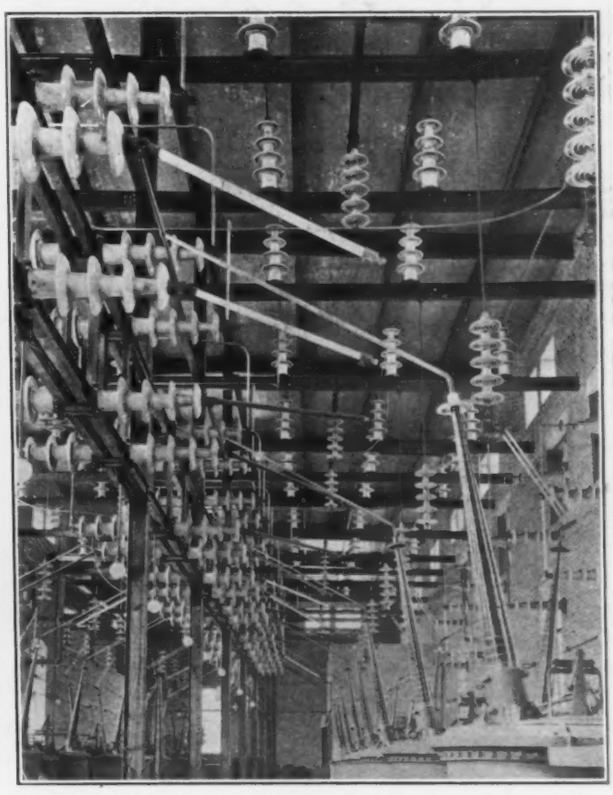


Fig. 31—General View of 110,000-Volt Layout, Dundas Station.

All stations are equipped with a similar oil and air circulating system. The water system is varied in the different stations to suit local conditions, but in each case duplicate pumps are provided unless that station is connected to the

local domestic mains. The erection-room is located near the end of the building, and contains a 45-ton traveling crane, with electric hoist, hand-bridge and trolley travels. The control-room is situated near the erection-room in an inclosed gallery overlooking the high-tension switch and erection rooms. From the control gallery the operator has an unobstructed view of the erection and high-tension switch rooms. Eventually these galleries will be located in the center of a building 344 ft. long and 50 ft. wide. The high-tension switchroom extends along one side of the building and contains all the high-tension transformer, line and disconnecting switches, together with the high-tension busbars.

DUNDAS STATION.

The Dundas station (Fig. 26) is the main interswitching station of the present system. From this station the outgoing transmission lines radiate to the various substations of the system.

The station equipment consists of four 750-kva oil-insulated, water-cooled 110,000-volt to 13,200-volt Westinghouse step-down transformers, for supplying the city of

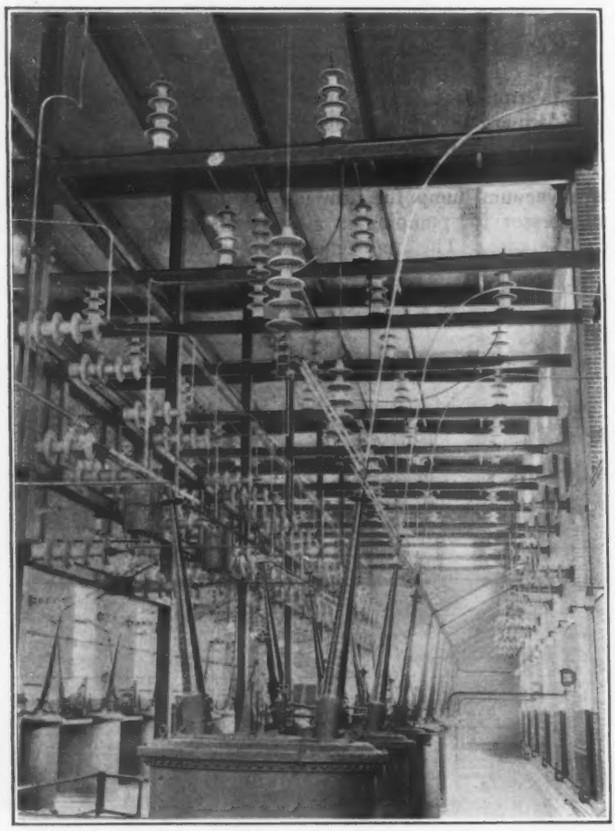


Fig. 32—High-Tension Details, Dundas Station.

Hamilton and vicinity; seven 110,000-volt Westinghouse electrically operated circuit-breakers equipped with condenser-type bushings; six sets of the out-door-type 110,000-volt electrolytic lightning arresters, and two sets of 13,200-volt electrolytic lightning arresters (Fig. 28). Seven 110,000-volt, three-pole automatic solenoid-operated oil switches are used, one for each incoming and outgoing line and one for a bank of three 750-kva transformers. The two sets of 110,000-volt buses are supported on horizontal I-beams near the roof, similar to those at the Niagara Falls station. One set of disconnecting switches is provided on the line side of each oil switch, while on the station side there are two sets, so arranged that any line may be connected to either set of buses.

The same method of installing and removing transformers is employed as at Niagara. In fact, the same arrangement is used in all stations in the system. The transformers are connected star delta with a secondary potential of 13,200 volts. A spare transformer is held in readiness to replace any transformer of the connected bank, should one become disabled. The 13,200-volt switches and busbars are inclosed in concrete cells. The present structures accommodate the transformer switch, two line switches and the service transformer switch. These are all automatic, electrically controlled oil switches, each provided with relays best suited for the requirements. The service transformers perform similar functions to those at Niagara Falls; that is, supply light and power for station use. Three oil-insulated, self-cooled 75-kva transformers, stepping down from 13,200 volts to 2200 volts, are used to serve the town of Dundas.

The station operation is effected from an inclosed control-room situated at one end of the high-tension switch-room, in which are located the main control and service boards. As at Niagara, the control switchboard carries all the control switches operating at 110 volts direct current for the remote control of the high-tension and low-tension power switches and also the meters. The service board is a regular switchboard employed to distribute the power to the different lighting and power circuits in the station. The mechanical and cooling equipment in general is the same as in the step-up station.

In both the Niagara Falls and the Dundas stations condenser bushings are used on all high-tension switches and transformers. With a few exceptions the entire equipment of these two stations was furnished and installed by the Canadian Westinghouse Company. At the present time arrangements are being made for the installation of an additional bank of power transformers and the necessary switches.

TORONTO STATION.

This station (Fig. 34) is in three sections, each running the length of the building—the high-tension switching section, the transformer section and the low-tension switching section (Fig. 33). The incoming lines are protected by electrolytic arresters placed inside the building, with the horn-gaps mounted on steel structures outside. The hoods for the outlets are built with a floor, upon which the entrance bushings are mounted. These bushings consist of stacked porcelain rings, with a pronounced petticoat. The different sections are clamped together with a brass bolt extending through the centers. The intervening space between the brass and the porcelain is filled with concentric fiber rings and insulating compound. As the arresters are placed inside the building and the gaps outside, six of these bushings are required for each line. Spiral choke coils are used and are inserted in the power lead on the inner side of the entrance.

The 110,000-volt oil-switch equipments consist of two line and two transformer switches, each in the busbar circuits. The general arrangement of 110,000-volt buses and connections (Fig. 35) is similar to that at Niagara Falls and Dundas, except that the insulators used are of a corrugated rather than a petticoat type. The bushings employed on the General Electric oil switches and transformers are made of pressed annular ringed sections of compound clamped together, and the interior space is supplied with concentric cylinders of treated fiber reaching the length of the bushing, which after assembly is filled with a viscous compound while hot and sealed.

The transformer equipment consists of two banks of 1250-kva transformers stepping down the transmission voltage to 13,200 volts. The secondary leads branch and run through oil switches to two sets of buses, each of which is divided into two parts. The cell work is built with pressed-brick walls and concrete shelves. Ultimately it is planned to have two ring buses, each ring being in four sections. At the present time there are eight feeders, each provided with automatic oil switches for connecting to

either set of buses. The oil switches and buses are located in two rows on a gallery, while the potential and series transformers are placed in compartments on the main floor immediately beneath the switches. Each bus is protected by an aluminum-cell surge protector set. The outgoing feeders leave the building by underground ducts and run to the five municipal substations in different parts of the city located and connected so as to form a loop circuit.

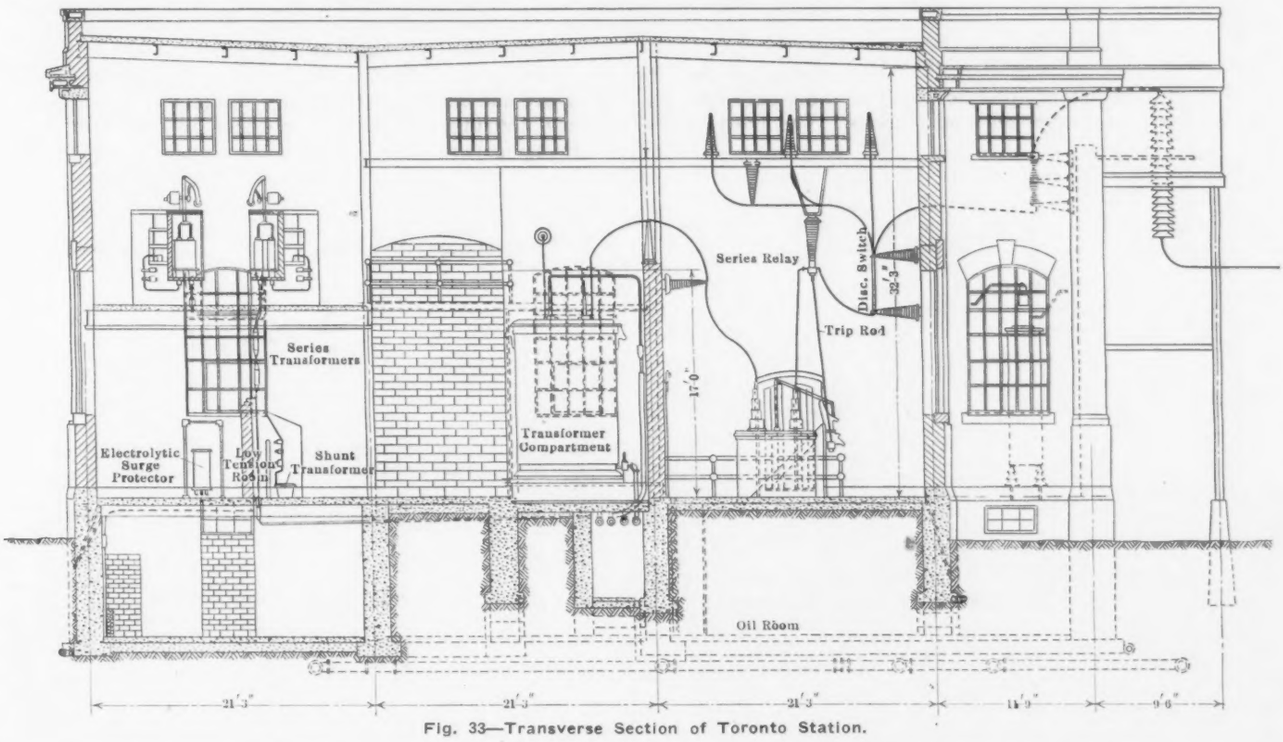


Fig. 33—Transverse Section of Toronto Station.

There are at present being installed in the basement of the building by the city of Toronto transformers stepping down from 13,200 volts to 2200 volts. This transformer station when completed will be used as a substation for city service, mainly to supply power for the factory load of the city, a large part of which is located within ½ mile of the station. The control switchboard is located on a small open gallery. All 110,000-volt and 13,200-volt switches may be operated from the board. Curve-drawing meters are mounted on the feeder panels for recording both the load and the power factor. A concrete pump house has been constructed a few hundred yards distant on the shore of

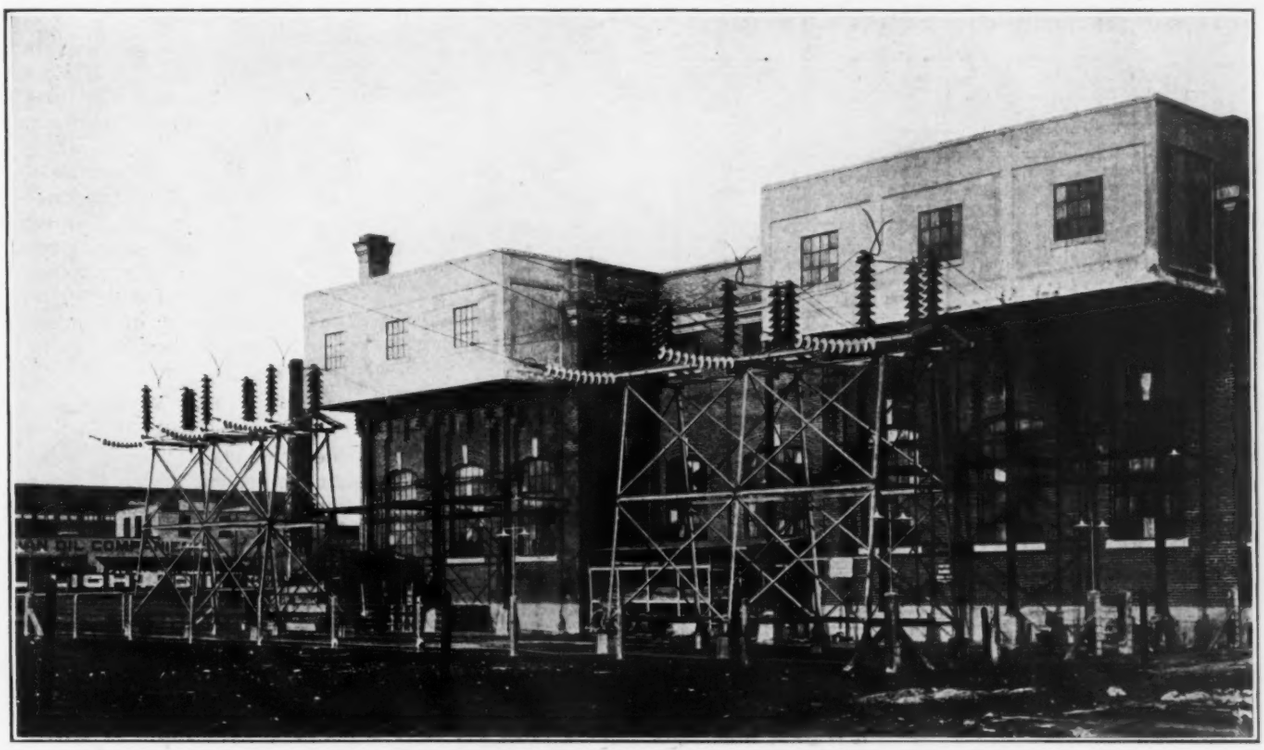


Fig. 34—General Elevation of Toronto Station.

Lake Ontario, with an intake pipe extending 500 ft. into the lake to provide cold water for cooling purposes. Duplicate motor-driven pumps and a service equipment similar to that at the Niagara Falls station have been installed.

GUELPH, PRESTON, BERLIN, ST. MARY'S, WOODSTOCK AND PORT CREDIT STATIONS.

The 110,000-volt equipments in all of these stations are similar, since they are all loop stations. The lines enter

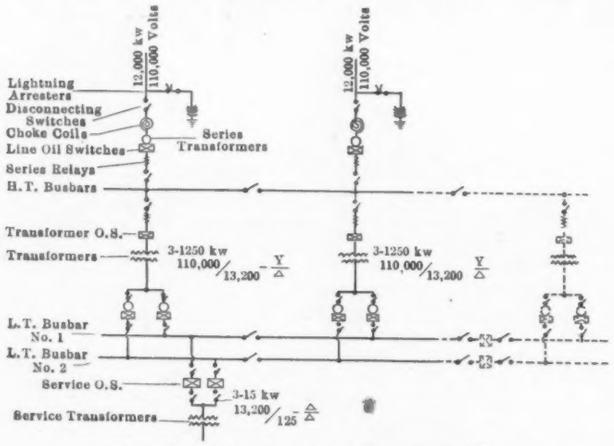


Fig. 35—Wiring Diagram, Toronto Station.

the stations through automatic oil switches to the buses and pass out through similar circuit-breakers (Fig. 36). The incoming and outgoing lines in each station contain electrolytic arresters. The transformers are supplied with high-voltage current from the bus through an automatic oil switch. Disconnecting switches (Fig. 37) are installed on either side of the oil switches, except on the transformer side of the transformer oil switch. Each station is equipped with a bank of three single-phase transformers and a spare unit, available for use in case of an emergency.

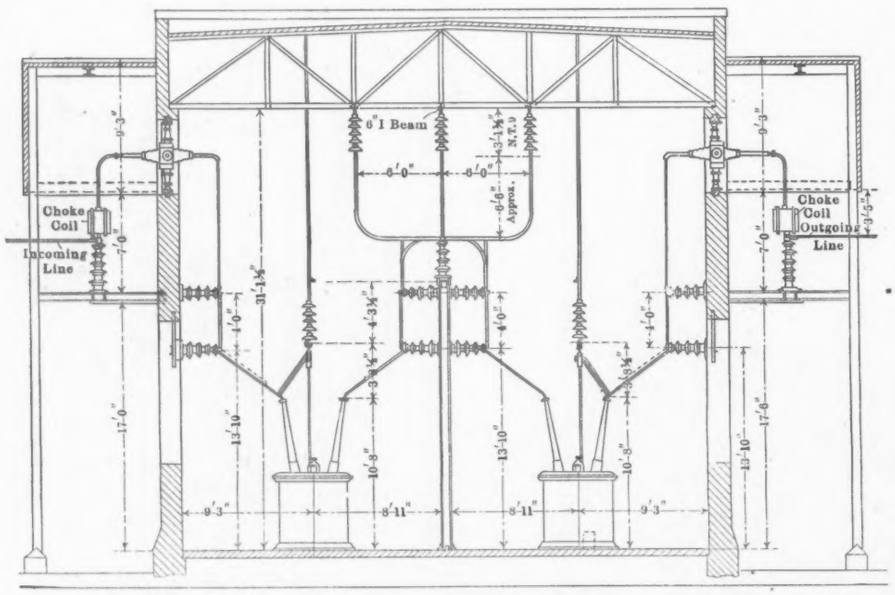


Fig. 36—Section Through Typical Station, Showing Line Entrance and Switching.

The capacity of each transformer is 750 kva, except those at Port Credit, which have a capacity of 1250 kva. The secondary potential is 13,200 volts in each case, with the exception of Preston. The greatest transmission distance from this station was 6 miles, and 6600 volts was therefore adopted for distribution purposes. All transformers are supplied with taps for 6600 volts and 13,200 volts.

The type and general arrangement of low-tension equipment is the same in all stations, the only difference being in the number of outgoing feeders. Each feeder is equipped with an oil switch, disconnecting switches and electrolytic arrester to bus. The control for each feeder consists of switchboard panel containing indicating and recording meters, relays and handle for operating switch. Provision has been made for six outgoing feeders in each of the present buildings. Preston, Berlin and Woodstock are now utilizing their full complement of feeders. The service equipment, both electrical and mechanical, is in general the same as in the stations previously described, except that, since the switches are hand-operated, no stor-

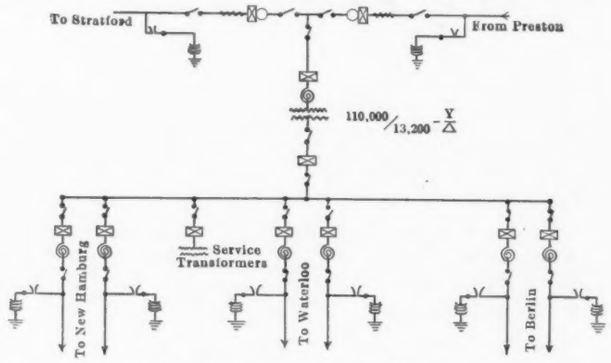


Fig. 37—Wiring Diagram, Berlin Station.

age battery or motor generator is required. Duplicate water pumps are provided for cooling water, except in instances where city water service is available. In any of these stations, as well as in London and St. Thomas, the spare transformer may be quickly connected in a bank to replace a disabled one.

LONDON STATION.

This station is a "loop" station with a branch line running off the bus. The high-tension equipment is practically the same as in the "loop" stations already mentioned, with the addition of an oil switch connecting the bus and supplying a line running to St. Thomas. There are four 110,000-volt and six 13,200-volt oil switches in the station, all of which are electrically operated. Three 1250-kva transformers are installed, with a spare unit for use in case of emergency. Four 13,200-volt feeders supply power to the city of London's distributing stations and to the provincial asylum.

ST. THOMAS STATION.

This station will ultimately be the same as a "loop" station. At the present time it is a terminal station and consequently has no 110,000-volt outgoing line equipment. There are no new features about the wiring plan in this station, which is the same as at Guelph, Stratford, St. Mary's, etc., except that there is no outgoing high-tension line. The transformers step down from 110,000 to 13,200 volts, and there is the usual complement of disconnecting switches, oil switches, choke coils and electrolytic lightning arresters. The equipment is an exact duplicate of that at Guelph and the other standard-loop stations just described. When the high-tension lines are extended farther to the west they will leave from the St. Thomas substation.

OPERATION.

The Dundas station, being situated at a central point, has been designed as controlling station for the entire system, and at this point are located the chief operator and his assistants, who act in the capacity of load dispatchers.

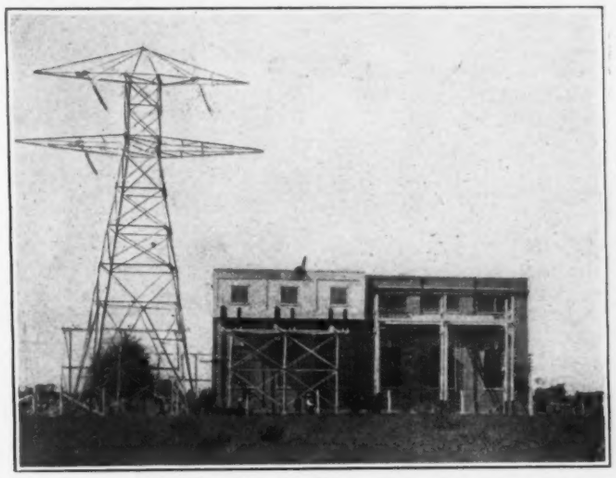


Fig. 38—General Elevation, Berlin Station.

These operators are in constant touch with the operators at the other stations through the private telephone system which has been installed. In case of trouble on any part of the high-tension lines the faulty sections can be cut out and energy fed to all of the stations. The switching arrangements which have been provided at Dundas make this possible. As the Niagara station is the source of supply for the entire system, it is necessary to maintain communication between this station and the Dundas station at all times, and a duplicate telephone line has been provided.

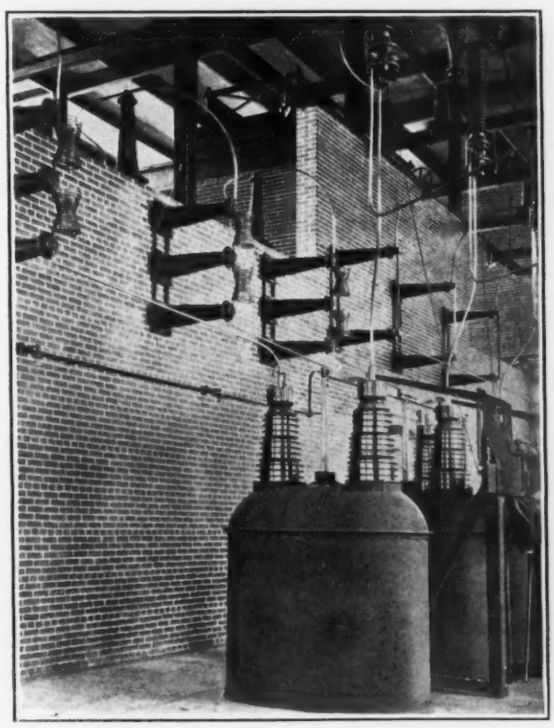


Fig. 39—110,000-Volt Switch, London Station.

The operating staff, in addition to the chief operator and his assistants, consists of two helpers at the Dundas station and three operators at each of the other stations except Niagara and Toronto, where there are staffs of five.

ELECTRICAL EQUIPMENT OF A GREAT GROUP OF OFFICE BUILDINGS—II.

Busbar and Switchboard Equipment of the Prudential Insurance Company at Newark, N. J.

BY HENRY C. MEYER, JR., AND BASSETT JONES, JR.

A PREVIOUS article, which appeared in the issue of Jan. 13, was devoted to the history of the Prudential installation, including a description of the engine-room. In the present article is given a short account of the busbar and switchboard equipment. Several

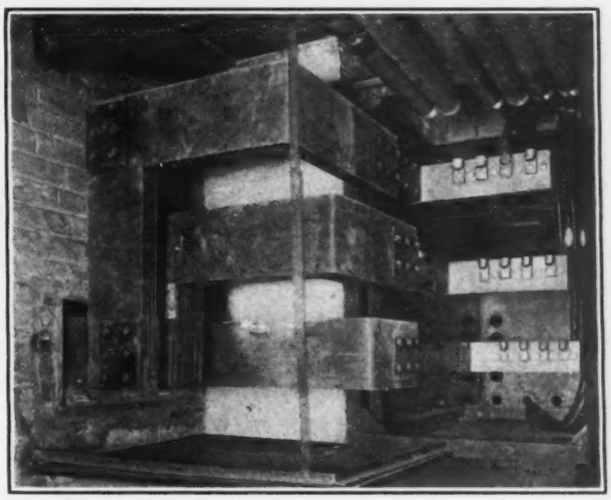


Fig. 7—Bus Detail, Old Engine-Room Junction.

articles will follow describing other parts of this installation.

BUSBAR EQUIPMENT.

The busbars on the generator contactor boards extend down into a pit below the board and there connect directly

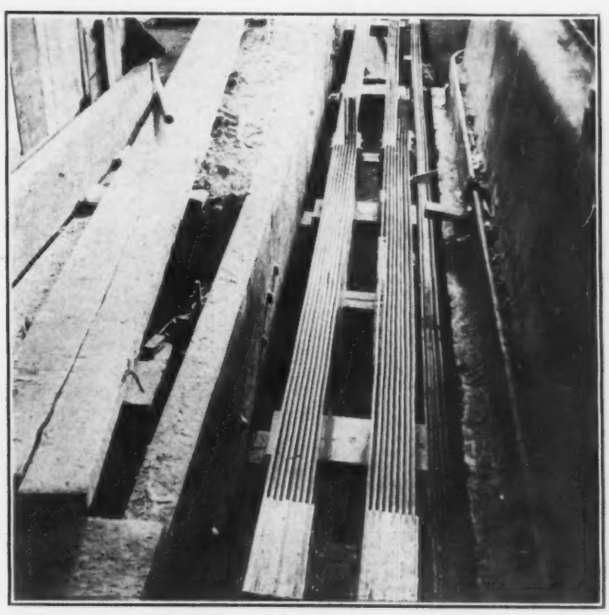


Fig. 8—Main Generating Busbars, New Engine-Room.

to the main generator busbars, which are run in a deep trench at one side of the engine foundations. These busbars in course of construction are shown in Fig. 8, the view corresponding to the position marked *X* in Fig. 11. They

are supported on structural steel bents with soapstone seats.

At the east end of the engine-room the generator buses, together with the conduits containing control lines, ammeter leads and pressure wires, enter a tunnel through which they extend to the passage under the old boiler-room floor in the old building. Here they rise to the ceiling of this passage and connect with the busbar leads from the old generators in the old plant.

From this point the positive and negative buses extend easterly along the ceiling of the passage to the contactor-board room. Fig. 9 shows the general route of these busbars. That portion of the busbars marked *A* in Fig. 9 is shown on a large scale in Fig. 11, both plan and elevation, and that portion marked *B* in Fig. 9 is similarly shown in Fig. 12.

Fig. 13 shows a detail in the passage which looks in the direction indicated at *C* in Fig. 11. Fig. 14 shows where the buses rise to the ceiling of the passageway at *D* in Fig. 11. Figs. 10 and 15 show the main busbars hung from the passageway ceiling at *E* in Fig. 12. Fig. 7 shows the terminus of the generator busbars under the floor of the old engine-room where the cable leads from the old generators connect with them at *F* in Fig. 12.

Figs. 11 and 12, the bars are exceedingly tortuous and bent in all kinds of forms to avoid old pipes and ducts that could not be moved or even temporarily shut down.

Approximately 70,000 lb. of copper in the form of 8-in. by 0.25-in. laminations was employed in the construction

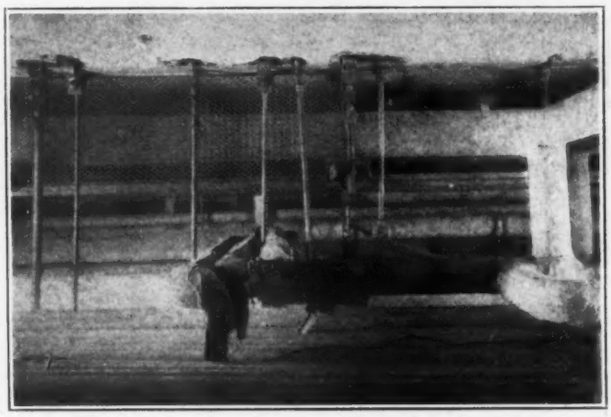


Fig. 10—Detail of Main Bus.

of this busbar work, the main leads consisting of ten laminations each in the positive and negative legs and five laminations in the equalizer leg. Between the fishplates and on all supports cast-iron space plates with projecting spacing teeth were employed. A disconnecting switch has since been installed in the busbars in the waste-paper room (see Fig. 12).

The only changes made in the old generator plant were to remove the old generators and replace them with new

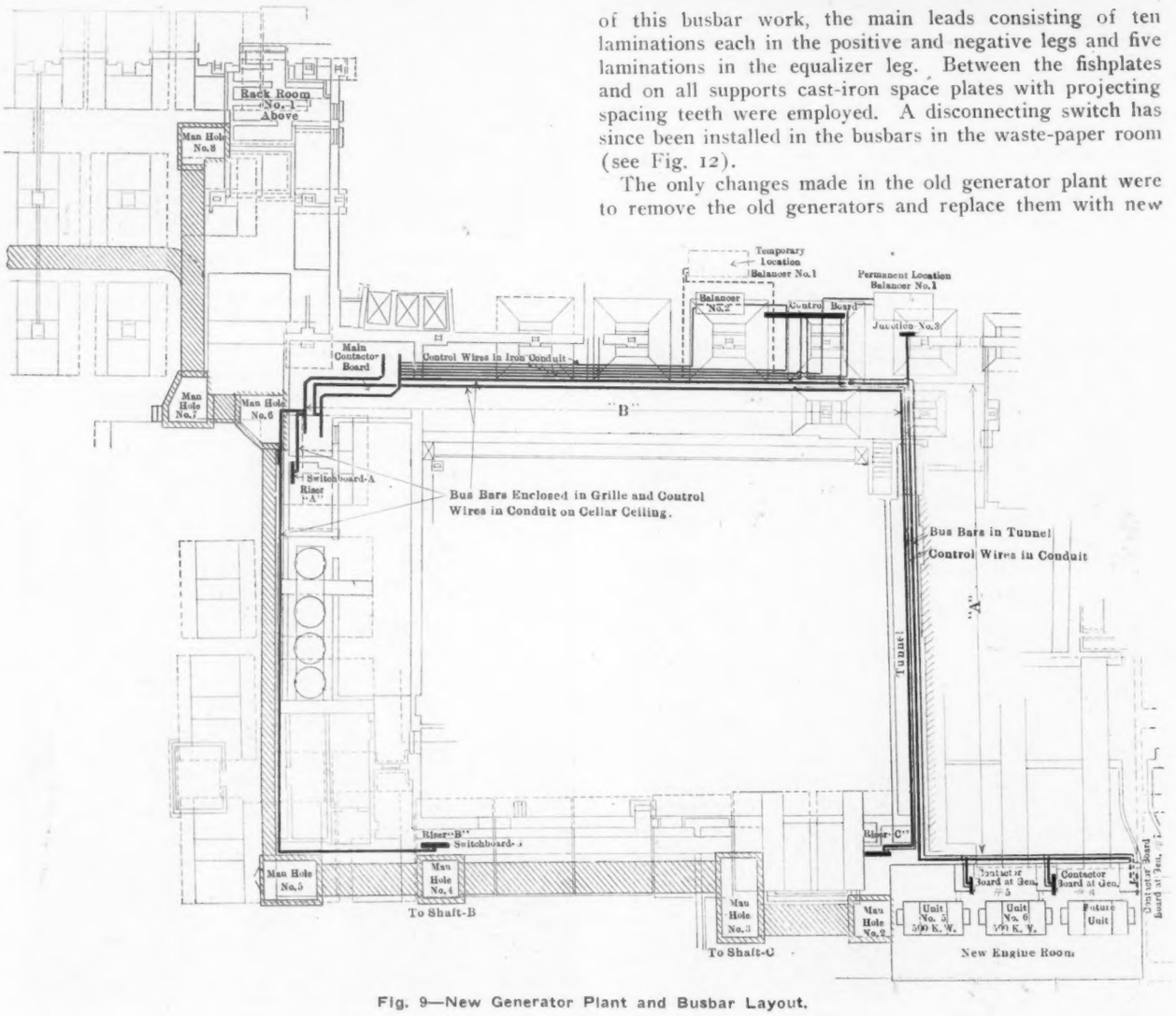


Fig. 9—New Generator Plant and Busbar Layout.

The photographs convey no adequate idea of the difficulties met and overcome in locating and installing these very heavy bars. Throughout a large part of the route they are run close to steam pipes in locations at permanently high temperatures. In many places, as shown in

240-volt machines. As in the new plant, each machine was provided with a generator contactor board, the buses on this board being extended to and bolted on the generator terminals. The 250-kw machine contactor panel is shown in Figs. 16, 17 and 18.

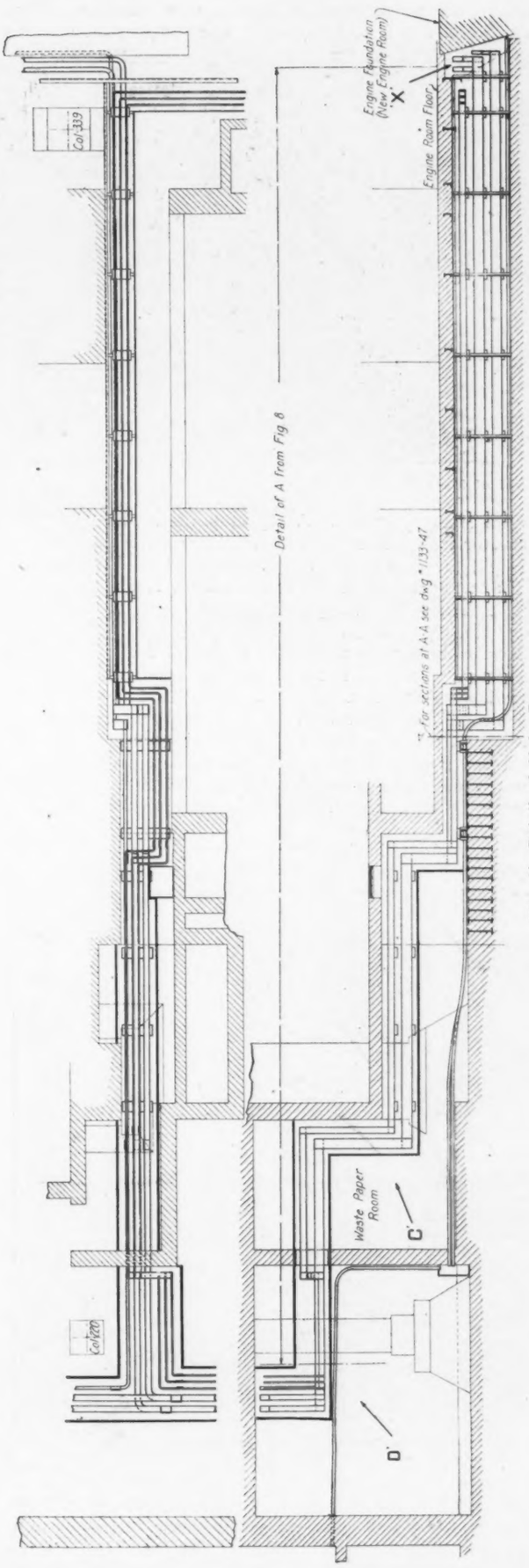


Fig. 11—Detail of Main Bus.

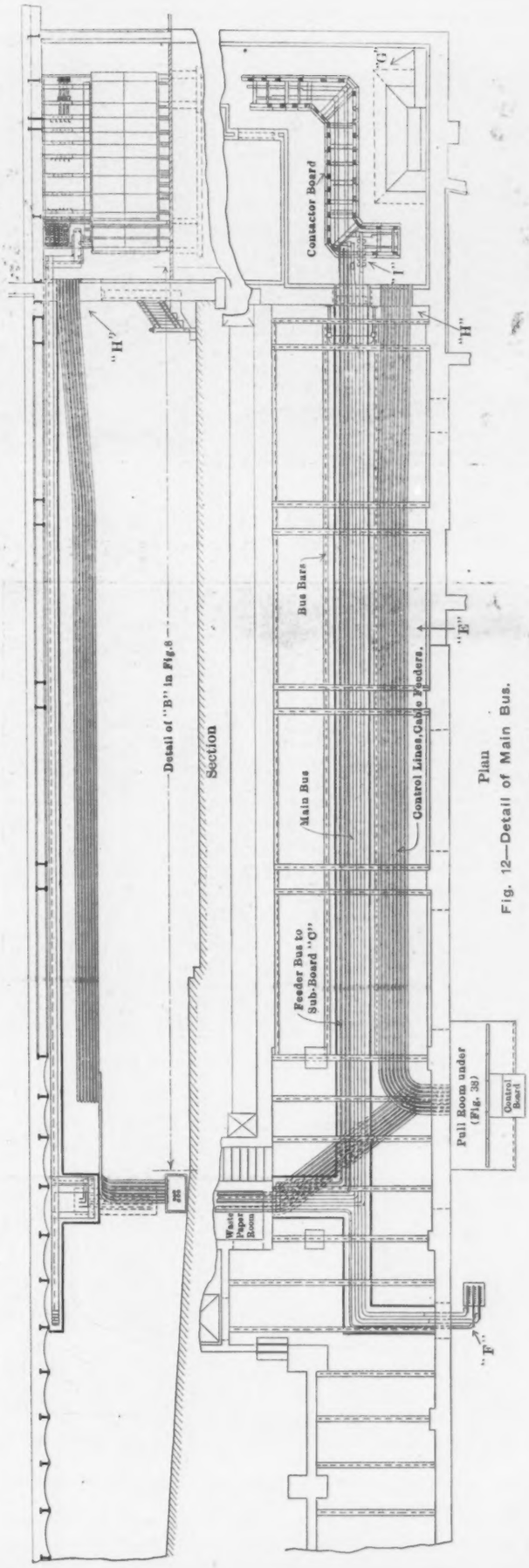
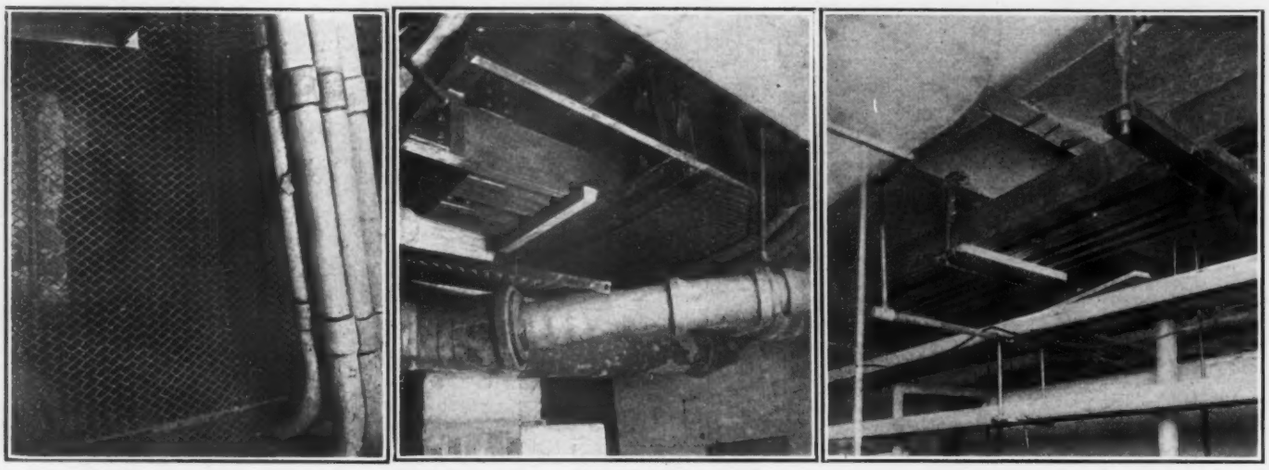
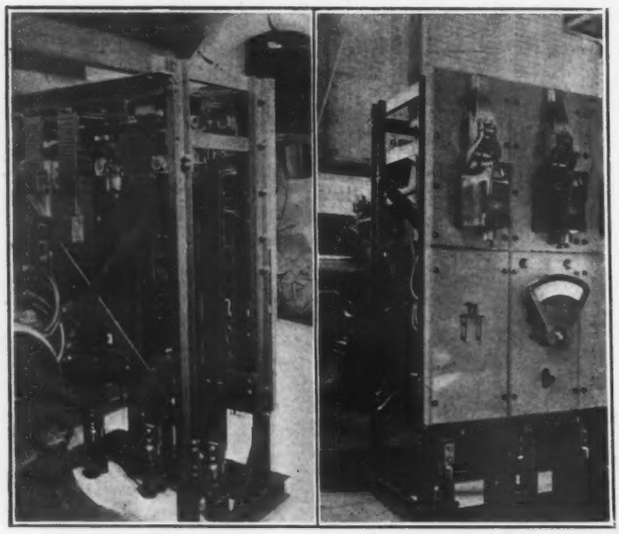


Fig. 12—Detail of Main Bus.

In order to establish the neutral on the three-wire lighting feeders two balancer sets were installed in the old engine-room. The sets are capable of handling a maximum unbalance of 800 amp flowing in the neutral; that is, about 12½ per cent of the average maximum of the present load on the plant. The main switchboard for operating this equipment, known as "switchboard No. 1," consists of three parts: the control board shown in Fig. 19, the generator contactor boards already described, and the main contactor board shown in Figs. 20, 21 and 22.



Figs. 13, 14 and 15—Details of Main Bus.



Figs. 16 and 17—Generator Contactor Board.

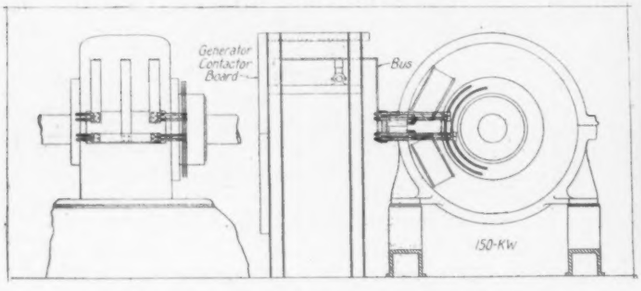


Fig. 18—Detail of Arrangement of Generator in Old Engine-Room.

REMOTE-CONTROL SWITCHBOARD.

The control board is built of selected gray Tennessee marble, with a blue Vermont marble sanitary base. The instrument cases, rheostat wheels, escutcheons, switches, etc., are finished "old copper." The cornice and columns are of statuary bronze. A copper diffuser with opal-glass deflector trough is arranged back of the cornice and serves to light the face of the board. Name-plates have reverse etched titles and are finished to match the rest of the metalwork. The instrument panels contain seven generator ammeters, a high-load station ammeter, a low-load station ammeter, main neutral ammeters, a high-load curve-drawing ammeter, a low-load curve-drawing ammeter, a curve-drawing voltmeter, a station voltmeter and a differential double coil voltmeter both on a swinging bracket, and a horizontal edgewise zero-point ammeter connected into the neutral leg of each three-wire feeder. The last-mentioned instruments make it possible for the operator to tell at a glance the amount of unbalance in the feeder to each sub-switchboard.

Two horizontal edgewise voltmeters are also provided, each connected to a 20-point voltmeter switch on the operating desk so that pressure readings may be taken at the various sub-switchboards. One point in each switch is so connected that the instruments may be connected between neutral and outside buses to obtain simultaneous balance voltage readings.

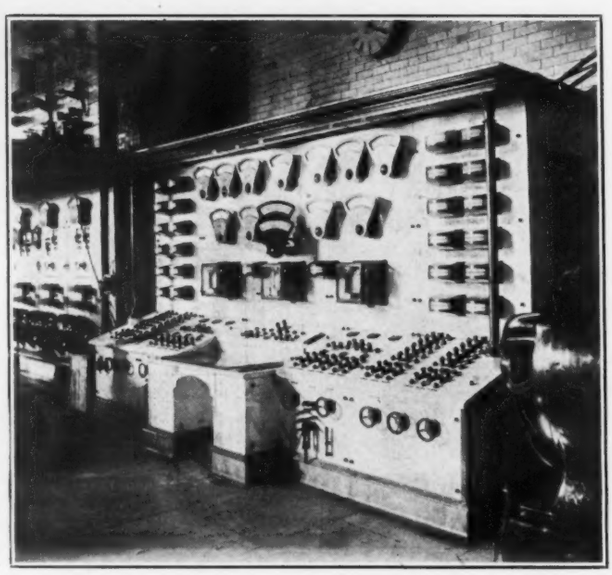


Fig. 19—Control Board, Switchboard No. 1.

The control switches for operating the contactors on

the generator panels and the contactor board are of the pull type mounted on the benchboard. They have combined mechanical and lamp signals, the first operated by the control switch itself, the latter operated by auxiliary switches on the contactors.

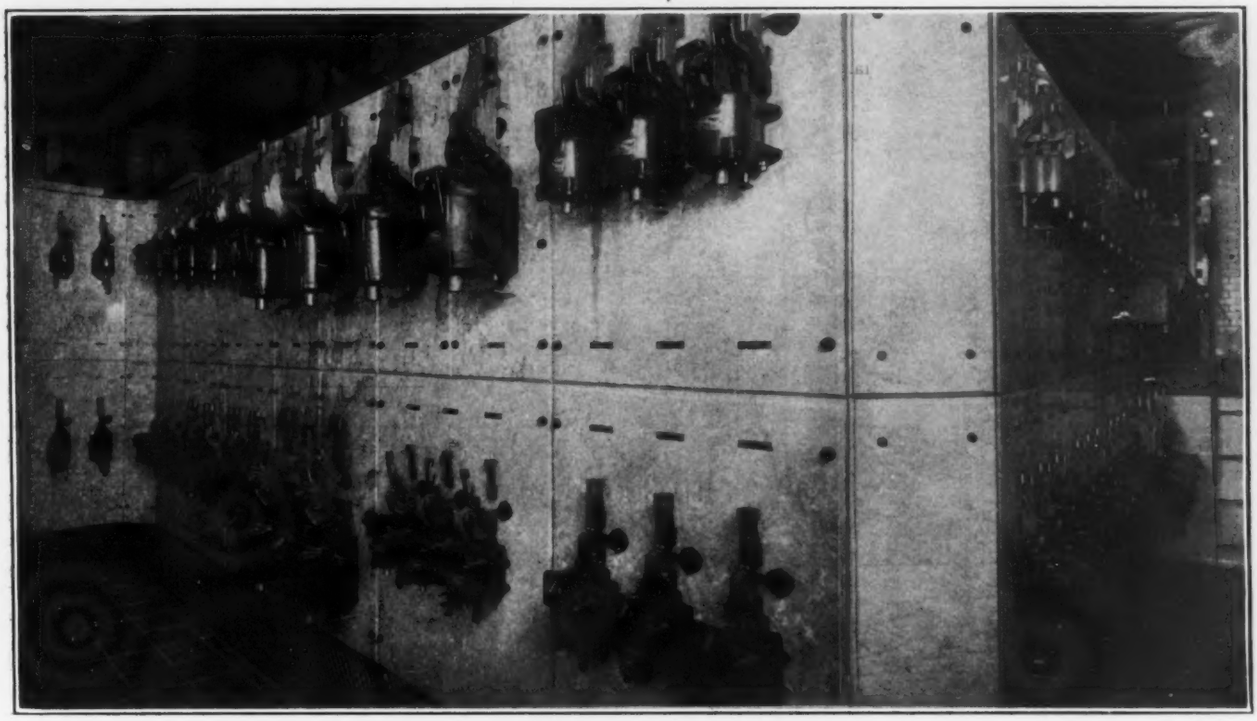
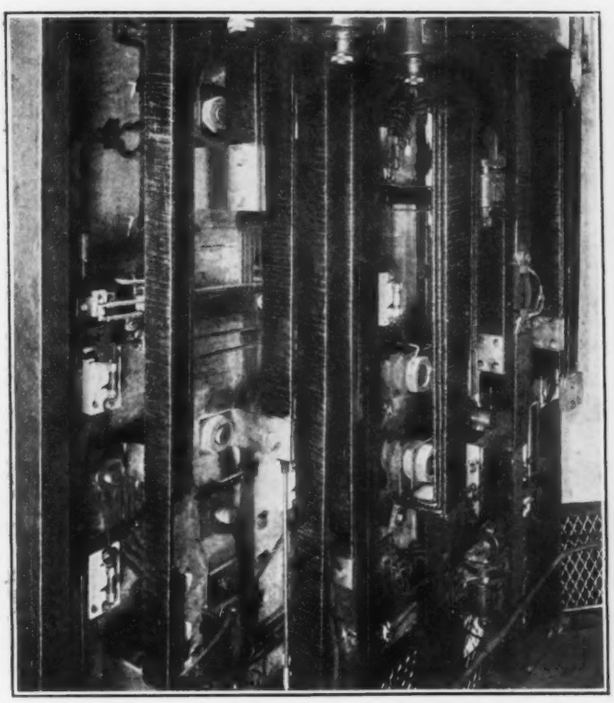


Fig. 20—Main Contactor Board, Switchboard No. 1.

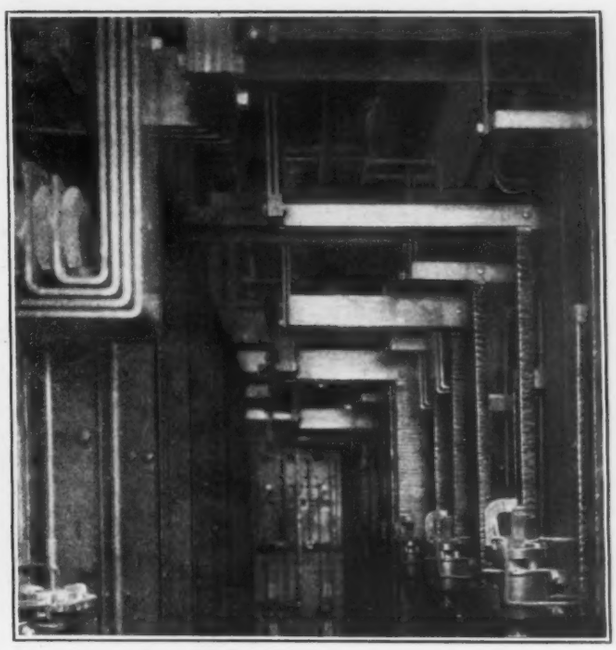
The generator and balancer rheostats are mounted on the wall behind the board and are driven from the rheostat wheels by the usual chain sprocket and shaft mechanism.



There is a single rheostat for each balancer set arranged with a throw-over field switch so that the rheostat may be connected into the shunt-field circuit of either machine in the set at will. This arrangement obviates the confusion usually attendant on the use of two independent rheostats.

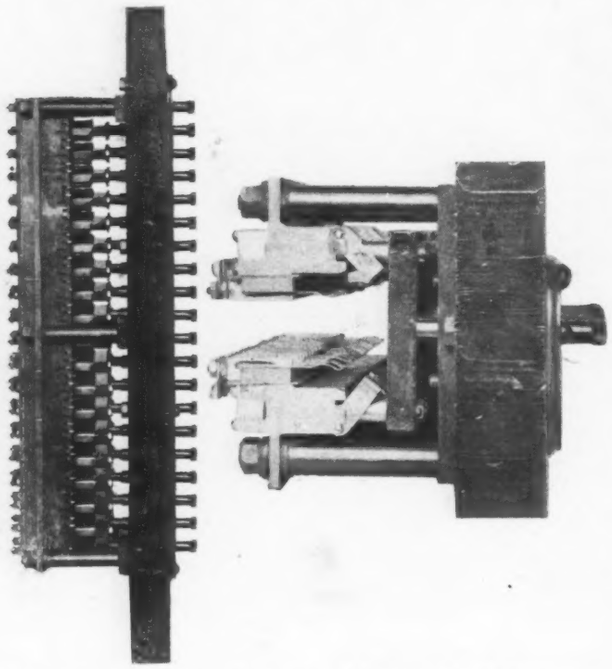
OPERATING DESK.

The balancers are started by pump ratchet switches, which are short-circuited by the balancer contactors when these are closed after the machines have been run up to speed. The operating desk in the center of the benchboard is provided with log drawers, a plate-glass writing pad under which is a complete colored diagram of the connections, the voltmeter switches above mentioned, a portable lamp plug and receptacle, an exterior telephone set and an interior telephone set for calling and talking to the



Figs. 21 and 22—Details of Main Contactor Board, Switchboard No. 1.

operators in the new engine-room. This set is self-contained and is directly connected to the set in the engine-room so as to be independent of the general battery service and thus to reduce failure to a minimum. For this purpose it is magneto-ringing and has no talking battery, the



Figs. 23 and 24—Voltmeter Switch Interlocking Push-Button Type.

energy for talking being generated by the voice with the aid of a repeating coil.

GONG SIGNALS.

A system of gong signals between the various parts of "switchboard No. 1" has been provided. A push-button is located on the desk to operate a signal gong in the new engine-room. Each generator panel is also provided with a similar push-button operating a gong behind the control board so that signals can be interchanged using a code system. The control-board gong is also operated through a relay by auxiliary switches on each contactor on the generator panels and on the contactor board. This relay is arranged to operate the gong continuously until reset by the operator. By this device attention is drawn to the board whenever a contactor opens, and the signal lamps indicate which circuit is affected.

Just above the operating desk are provided seven pairs of plug switch receptacles which are connected to lines running to the generator panels where they connect through a double-pole switch to the machine terminals. By inserting the plugs in any pair of terminals all switchboard lamps and the emergency lamps in the cellars, at the sub-switchboards and in the engine-rooms are connected to one generator back of all automatic switches and circuit-breakers. Thus it is practically impossible for the plant and cellars to be left in darkness through the opening of any generator circuit. The emergency lamps are mounted in lock sockets and operated at 240 volts. The "on" control switches of each generator panel are also connected to these lines so that it is impossible to close any generator contactor unless the machine is up to voltage and the double-pole switch on that generator panel has been thrown in.

One other item of interest on this board is the type of voltmeter switch used. This switch is shown in Figs. 23 and 24 and was designed especially for this equipment. It is a push-button switch with interlocking buttons so that only one button may be pushed at a time. The button is locked down by giving it a quarter turn.

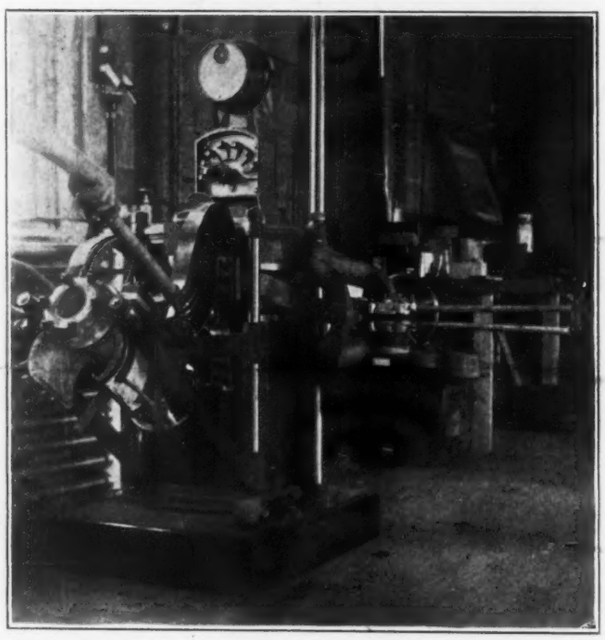
It was first proposed to locate the control board temporarily in the old engine-room so that the old board could be left intact until no longer needed. Difficulties as to weights and the obtaining of temporary supports in the crowded cellar below made it necessary to erect the board in its final location. To do this a temporary wooden board and gallery was built over the generator panels of the old board, as shown in Fig. 19, and the feeders were successfully transferred to this temporary board with the plant in operation and without interruption of service. The abandoned feeder panels were then removed and the control board was erected in their place.

The control board is 15 ft. long and forms the principal feature of the engine-room, it being of remarkably handsome appearance.

AN ELECTRIC FURNACE THAT MELTS PLATINUM.

Mr. W. M. Maurey, an assayer and metallurgist of St. Paul, Minn., has recently put into service the 4-kw electric furnace shown in the accompanying illustration, in which gold, platinum and other refractory metals can be melted readily. The furnace is of an imported type, built by M. Hellburger, of Munich, Germany, and is believed to be the only one of its kind in use in America.

The 220-volt alternating-current service of the Northern Heating & Electric Company is supplied to the primary winding of the 4-kw step-down transformer within the frame. The low-voltage secondary of the transformer, through great copper leads 3 in. square in cross-section, is short-circuited by one of the two graphite crucibles in which is placed the metal to be melted. Adjustable conductors and graphite clamp pieces are provided for holding the crucible, which is raised to incandescence by the flow of the thousands of amperes of low-potential current which traverse it. The small crucible at the right is arranged for



Assayer's Electric Furnace for Melting Gold, Silver and Platinum.

obtaining especially high temperatures to heat small quantities of material. Gold and silver are quickly reduced to a molten condition in the furnace, and even platinum, which liquefies at 3200 deg. Fahr., can be completely melted in about ten minutes' time.

Central Station
Management, Policies and Commercial Methods

Employees' Clubrooms at Fort Smith, Ark.

On Christmas evening, Dec. 25, the Fort Smith Light & Traction Company presented its 330 employees with a comfortably appointed suite of clubrooms on the second floor of a downtown building. Mr. J. W. Gillette, manager of the Fort Smith company, urged every man with the company to make free and full use of the new apartments, which include a library and reading room, lounging chairs, billiard and pool tables, shower baths, etc. An organization of the employees has been effected to care for the rooms placed at their disposal.

Electric Vehicles in Oklahoma City.

Oklahoma City, Okla., with a population of 86,000, has 300 electric vehicles. Although twenty years ago a frontier camp, Oklahoma City now boasts the largest amount of paved streets and sidewalks per capita of all the cities in the United States. It has more miles of asphalt paving, according to Mr. W. R. Molinard, manager of the Oklahoma Gas & Electric Company, than all the cities of its big neighboring State, Texas. These excellent paved streets have done much to encourage the use of electric vehicles in such a young community. The central-station company makes use of several electric runabouts for its solicitors.

Large per Capita Use of Electricity.

Several of the suburbs of Chicago served with electrical energy by the Public Service Company of Northern Illinois have rather exceptional records in the proportion of consumers to total population. Thus, in La Grange, with a population of 5282, the company has 1108 meters installed, while in Oak Park, with 19,440 inhabitants, there are 5022 customers' meters in service. Park Ridge, a considerably smaller suburb, has 2009 inhabitants and 512 meters, but the best showing of all is presented at Flossmoor, a high-class residential suburb south of the center of the city. Here there are thirty-five houses and thirty-five meters, every householder being a customer of the company.

Electric-Vehicle Charging in Erie, Pa.

There are nearly 400 electric pleasure vehicles in use in Erie, Pa., a city of 75,000 inhabitants, according to Mr. S. C. Walker, secretary of the Erie County Electric Company. The company supplies energy to private garages at 4.75 cents per kw-hour. Most of these residential services are on direct-current lines so that no rectifier outfits are required. The public garages obtain the wholesale motor-service rate and secure energy as low as 3 cents per kw-hour where their consumption is large. The unusual number of electric cars in Erie Mr. Walker ascribes to the low rate afforded for charging energy, as well as to the efforts made by local commercial interests to have every electric-vehicle maker represented by some local gas-car agent. On nights when plays of note are being presented at Erie's theatres as many as 100 electric cars have been counted along the curbs of the downtown district.

Oklahoma City Adopts Electrolytic Purification of Sewage.

Oklahoma City, Okla., has contracted with Mr. W. R. Molinard, general manager of the Oklahoma Gas & Electric Company, for 130 hp to be used for the electrolytic disposal of the city sewage. A 75-hp purification plant is now being installed in the Packingtown district. The scheme of sewage purification used, similar to that at Santa Monica, Cal., was described in the *Electrical World* of May 4, 1911, page 1099, at which time a 7-hp experimental set had been put in for test purposes. The satisfactory operation of this preliminary small equipment is understood to have dictated the installation of the new plant.

An Emergency Breakfast.

When the household of Mr. L. C. Stevens, of Crystal Lake, Ill., one of the district superintendents of the Public Service Company of Northern Illinois, awoke on a recent morning during the "cold spell" it was found that the gas pipes were frozen up. As a gas range is used for cooking in this house, the outlook for breakfast was dismal enough, and with a temperature of 18 deg. below zero the prospect of beginning the day with a cold meal was not particularly cheering. In this emergency Mr. Stevens cast about to see what could be done with such electrical appliances as he had at hand. A percolator and a toaster would furnish coffee and toast, but that was hardly enough, so the electric flatiron was called into requisition, propped upside-down and used for cooking eggs, which was accomplished satisfactorily. Mr. J. G. Learned, a general contract agent of the Public Service Company, learned of Mr. Stevens' expedient and now declares that he has a new "talking point" in advocating the use of the electric flatiron in regions where gas pipes are liable to freeze up in winter.

Quick Installation of Electric-Power Service.

The power plant of a large lumber mill at Mobile, Ala., equipped with 275 hp in direct-current motors, burned recently, leaving the mill without any source of energy supply. The Mobile Electric Company was appealed to for help in the emergency and at once commenced the extension of one of its lines to the mill site. Thirty transformers of nondescript types and sizes were collected about the company's system, assembled near the ruins of the isolated plant, and connected in a bank to furnish service of proper voltage for the motors. All of the motors originally installed in the mill were of the direct-current type and were therefore useless for the alternating-current service, which was the only thing available. The central-station officials meanwhile hunted among their motor stocks and, with such unused motors as they were able to borrow in the town, got together enough machines to drive the lumber mill. These alternating-current motors then had to be put into position, replacing the direct-current machines, and the disabled mill was ready to start up again just five days after the fire which destroyed the power plant. Incidentally, too, it started up with a three-year contract for central-station drive, and the owner declares he will not rebuild his power plant.

Annual Efficiency Inspection at Minneapolis.

Once each year the Minneapolis General Electric Company, which does the local central-station business, has the engineers and representatives of its contract department visit customers in the business district for an "efficiency" inspection of their lighting and motor installations. The purpose of this campaign, as expressly declared, is not to secure additional contracts, but is limited entirely to improving the service furnished by the central station, without additional cost to its consumers. Data on the energy consumption of various classes of lighting and power installations are carried by the inspection corps, and in case the actual installations show consumption in excess of the usual values the customer is advised of ways in which he can improve his economy.

Such service is, of course, gratuitous on the part of the company and represents a part of the well-established policy of the Minneapolis central station to secure the highest efficiency in the utilization as well as the production of its energy. A secondary but important result of the inspection campaign is the up-to-date information thus afforded on the connected load and the character of the installation of each consumer. This data when obtained can be used to good advantage in further study of the field.

Minneapolis' electrical efficiency inspection for 1912 began Monday morning, Jan. 8, when more than twenty of the new-business engineers of the company started forth on their scrutiny of the local lighting and motor-service conditions.

Establishing a Motor Load Under Difficulties.

In the Malheur Valley of Oregon are located a number of grain and chop mills, the power requirements of which are very intermittent, both as regards daily hours' use and annual load-factor. These mills constitute the only industrial load in this territory, where the pursuits are principally agricultural. Heretofore most of the mills have been operated by gas engines, and the replacement of these by central-station service has been a problem requiring the best thought of local electrical men. In order to get electricity installed it has been necessary in most cases to allow long-time instalment conditions for the sale of motors. In other instances motors have been exchanged on an even trade for the gas engines, the motors being installed ready for service, free of charge, in the bargain. On account of the short-hour use of the motors the energy consumption rarely exceeds the minimum. In general this minimum has been held at $12 a year per horse-power, but in some cases it has been necessary to lower it to $6 a year. The motor installations range from 5 hp to 150 hp, averaging 15 hp to 25 hp in rating. A secondary problem brought up to the electric companies has been the disposal of the gas engines thus acquired through purchase and trade. The engines are sold at a low second-hand value where possible, care being taken to have them shipped out of the local field so as to avoid future competition from the same units. In figuring on the installation of motors a minimum allowance is made for engine value, the charge of replacement being carried as part of the construction account.

HOW A MOTOR BEAT AN ENGINE USING 12-CENT NATURAL GAS.

A large fruit dealer in a Southwestern city owned a refrigerating plant driven by a gas engine, the cost of operating which, with natural gas at $0.12 per 1000 cu. ft., was $12 a month. The gas engine gave considerable trouble by balking during some of the warmest days when ice was most needed, and much valuable fruit was spoiled each month. The engine was also troublesome to operate, for, besides breaking down at intervals, it would stop now and then from unassigned causes, was hard to start and made a lot of racket. The dealer had come to regard the loss of his fruit through lack of refrigeration as an incident to his business until the local central-station man took an interest in the case and began to ask questions.

The first thing he brought to the owner's attention was the value of the fruit that was needlessly spoiled. By the dealer's own estimate this loss amounted to from $100 to $200 each month. Reliable motor drive, the solicitor pointed out, would put an end to this loss, but the figure he estimated, $65 a month for electrical service, was nevertheless declared out of the question by the fruit dealer. However, permission was obtained to put the motor in for thirty days' trial at no cost to the owner if not acceptable at the end of that time. The cost of running the plant that first month proved to be $67, thus proving the accuracy of the estimate. When the trial period was up the dealer was asked if he was ready to return to gas-engine drive and wanted the motor removed. The way he shouted "No!" gladdened the solicitor's heart, and, of course, the installation "stuck." Since then the customer has doubled his mechanical equipment, using motor drive throughout.

Shortly after he had contracted for the first motor service the dealer received a timely call from a nice old gentleman who said he was in the market for a second-hand gas engine and would be pleased to pay something more than the junk value for the aggregation of cylinders, valves and spark-plugs now rusting in one corner of the electrified refrigerating plant. The sale was quickly made to the mutual satisfaction of both parties, and thus any temptation to return to engine drive was effectually removed.

ELECTRIC-METER TESTING IN THE SECOND NEW YORK PUBLIC-SERVICE DISTRICT.

By Charles F. Hunter.

Under the public service commissions law of the State of New York, as enacted in the spring of 1907 and as later amended, the Public Service Commissions of both the First and the Second District have specific duties given them in regard to the testing and maintenance of electric meters by the corporations and municipalities within their respective jurisdictions. The section of the law as regards electric meters is as follows:

"Inspection of Gas and Electric Meters.—Each commission shall appoint inspectors of electric meters whose duty it shall be, when required by the commission, to inspect, examine and ascertain the accuracy of any and all electric meters used or intended to be used for measuring and ascertaining the quantity of electric current furnished for light, heat or power by any person, corporation or municipality to or for the use of any person or corporation, and to inspect, examine and ascertain the accuracy of all apparatus for testing and proving the accuracy of electric meters, and when found to be or made to be correct the inspector shall stamp or mark all such meters and apparatus with some suitable device, which device shall be recorded in the office of the Secretary of State. No corporation, person or municipality shall furnish, set or put in use any electric meter the type of which shall not have been approved by the commission.

"Every gas corporation, electrical corporation and municipality shall provide, repair and maintain such suitable premises and apparatus and facilities as may be required and approved by the commission for testing and proving the accuracy of gas and electric meters furnished for use by it, and by which apparatus every meter may be tested.

"If any consumer to whom a meter has been furnished

shall request the commission in writing to inspect such meter, the commission shall have the same inspected and tested. If the same on being so tested shall be found to be more than 4 per centum if an electric meter, or more than 2 per centum if a gas meter, defective or incorrect to the prejudice of the consumer, the expense of such inspection and test shall be borne by the corporation or municipality; if the same on being so tested shall be found to be correct within the limits of error prescribed by the provisions of this subdivision, the expense of such inspection and test shall be borne by the consumer.

"The commission shall prescribe such rules and regulations to carry into effect the provisions of this section as it may deem necessary, and shall fix uniform reasonable charges for the inspection and testing of meters upon complaint."

This law (as regards electric-meter testing) imposes three duties upon the commissions:

(1) To require the installation of suitable apparatus and testing facilities for use in proving the accuracy of consumers' electric meters, and to inspect and ascertain the accuracy of such apparatus.

(2) To approve the type of all electric meters to be furnished, set or put in use by corporations or municipalities.

(3) To test electric meters upon the complaint of consumers.

In carrying out the provisions of this statute the commission found a great lack of uniformity in the meter-testing practice of the various corporations, and also, as might be expected, a very great difference in the types of meters and methods of their installation.

At the present time there are 291 corporations (which includes copartnerships and individuals) and forty-four municipalities now operating electric meters in the Second Public-Service District. This district, as is well known, includes the whole of the State of New York outside of the limits of Greater New York City, which includes the boroughs of Kings, Queens, Richmond, Manhattan and the Bronx. A recent census taken by the commission of the number and type of watt-hour meters installed throughout the Second District shows approximately 170,000 of these meters.

Both upon recommendation of the commission and their own motion a large number of corporations have purchased meter-testing apparatus, until at the present time there are 614 electrical testing standards of various kinds in use in the Second District. There are 315 rotating standards or portable integrating watt-hour meters and 299 indicating instruments, including voltmeters, ammeters and indicating wattmeters. During the past four years these have been checked from time to time by the traveling electric-meter inspectors of the commission, the method of test being by the use of portable standards which are checked once a month at the electrical laboratory of the commission at Albany by comparison with primary standards. Table I, published herewith, indicates the results of these tests year by year.

TABLE I.—RESULTS OF TESTS OF STANDARDS.

Year.	Number Standards Checked.	Number Found Inaccurate.	Number Recalibrated by State Inspectors.
1908	1812	218	30
1909	1744	70	63
1910	1739	42	36
1911	1318	76	49

In addition to the checking of the standards of the companies they are required to file monthly with the commission a report showing the number of meters tested and the condition of each as found. Table II, published herewith, indicates the results of these reports for the past three years.

TABLE II.—REPORTS OF COMPANIES' TESTS OF METERS.

Year.	Total Number Meters Tested.	Number Over 4 per Cent Slow.	Number Over 4 per Cent Fast.	Percentage of Accurate Meters to Total Number Tested.
1909	78,116	16,085	7,458	70
1910	84,576	14,742	6,247	75
1911	87,893	12,791	4,947	80

It will be noted from an examination of the above table that the percentage of accurate meters to the total is increasing every year. This, while it may be expected, is a very gratifying result, and demonstrates the desirability of periodic and thorough tests of the meter installations of the companies.

The third requirement of the statute as noted above—that of testing meters upon the complaint of consumers—has been carried out with the results shown in Table III.

TABLE III.—METERS TESTED UPON COMPLAINT OF CONSUMERS.

Year.	Number Meters Tested.	Number Over 4 per Cent Fast.	Number Over 4 per Cent Slow.
1908	85	20	14
1909	73	11	6
1910	130	15	35
1911	99	9	19
Total.....	387	55	74

A large number of the meters tested on complaint have been polyphase meters measuring large power installations. The commission, while it is authorized to charge for this service, has established a scale of fees which is nominal with respect to the cost of the work. The expense of testing a large polyphase meter is frequently considerable, particularly when the inspectors have to travel some distance and it is necessary to ship additional apparatus from the Albany laboratory for the test. One feature of the complaint tests which have been made on polyphase meters is that about one-half of these meters which have been tested have been found to be wrongly connected, the wrong connection usually consisting of a reversal of one of the current or potential elements. An interesting example of an incorrect polyphase meter connection which recently occurred is given in the accompanying illustration.

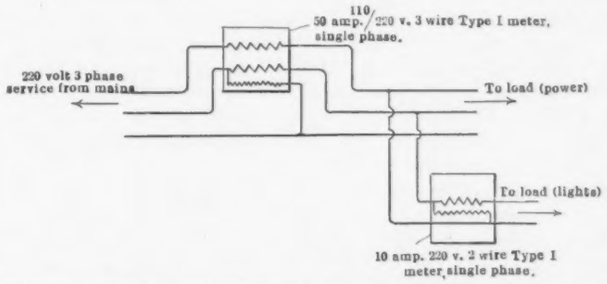

110/
50 amp. 220 v. 3 wire Type I meter, single phase.
220 volt 3 phase service from mains
To load (power)
To load (lights)
10 amp. 220 v. 2 wire Type I meter, single phase.

Diagram Showing Incorrect Use of Three-Wire, Single-Phase Meter on Polyphase Circuit.

From this illustration it will be seen that an attempt was made to measure a 220-volt, three-phase service with a 220-volt, single-phase, three-wire meter, and further that the three-wire meter measured the current in the lighting service as well as the two-wire meter, the consumer paying twice for his lighting service.

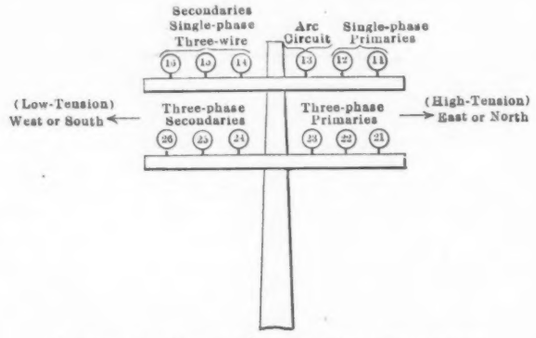
The commission has taken the ground that approval of types of electric meters mentioned should be given only after a thorough laboratory test into the performance of each type of meter. With this in mind it has prepared rules and regulations governing these acceptance tests. These rules were adopted largely from the meter code of the joint committee of the National Electric Light Association and Association of Edison Illuminating Companies. The present rules cover only direct-current and single-phase induction watt-hour meters, while rules for polyphase meters and graphic meters are now in preparation.

From the experience of the practical working of the law for the past three years there is no question as to the tendency to improve meter conditions in general. While the commission has not as yet issued any general order requiring companies to make periodic tests of their electric meters, the smaller companies which are not at present doing much meter testing are gradually taking up the work. The improvement in meter-testing appliances and methods in the last few years makes it much simpler for the small companies to carry on this important work, and with the assistance of trained meter men, such as the meter inspectors of the State authorities, it is possible for the smaller concerns to institute a meter-testing system which will be far more satisfactory than the old method of relying entirely on a factory test of the meter.

Wiring and Illumination.

NUMBERING SYSTEM FOR PINS AND CROSS-ARMS.

Much confusion, annoyance and actual danger may result from lack of precise and ready knowledge of the location of each wire on a given pole, its voltage, kind of service carried, etc. Systems of construction have been employed in which certain wires followed the right-hand side of the cross-arms, others being on the left side, as viewed going from the power house. Where such locations are not readily recognizable time is lost in tracing out the positions, and when trouble is to be repaired such interruption becomes acute. Mr. H. I. Ward, electrical engineer for the Muskogee Gas & Electric Company, Muskogee, Okla., has arranged a numbering scheme for his pins and cross-arms, as follows: On all poles the pins on the top arm are numbered as "tens," those on the second arm as "twenties," third, "thirties," etc., etc. On lines running north and south the poles are numbered from east to west, and on lines running east and west they are numbered from north to south. Six-pin arms are the standard, although some four-pin



Numbering System for Pins and Cross-Arms.

arms are used. As single-phase and arc circuits precede in most extensions, these take the top arm. On all lines running north and south single-phase primaries take the two east pins and are numbered 11 and 12. Since only one arc-circuit wire is run on a pole line, except in special cases, the arc wire takes the pole pin on the same side and same arm as the single-phase primaries, and is No. 13. Three-phase primaries take the second arm, pins Nos. 21, 22 and 23, being placed on the same side as the single-phase primaries. When single-phase three-wire and three-phase secondaries are run they take the opposite side of the pole and the same arm as the primaries feeding them. None of the pins are actually labeled, of course, the designation shown being simply memorized by those having to do with the lines. The same scheme is carried out on pole lines running east and west, all high-tension lines being placed on the north side of the poles.

At present the Muskogee company has 70 miles of pole line and 3252 lighting and motor-service customers, making 46.5 customers per mile of line, or a little more than one customer per pole.

RECENT TELEPHONE PATENTS.

SELECTIVE RINGING APPARATUS.

With the harmonic system of selective signaling the magneto cannot be used at the substation of local battery systems, as its variable speed causes interference with the

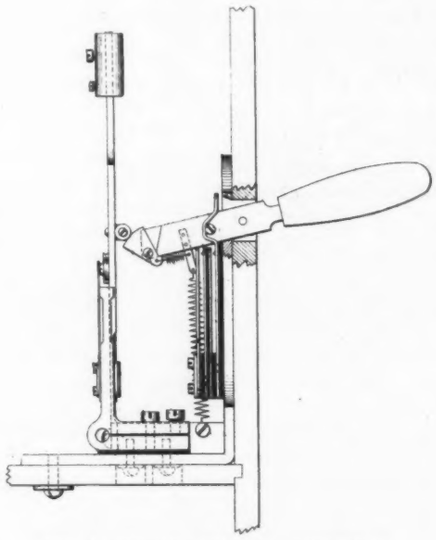


Fig. 1—Selective Ringing Apparatus.

various stations; that is, false calls are given. To obviate this difficulty Mr. W. W. Dean has devised a pole changer driven by a reed tuned to a non-interfering frequency. The accompanying illustration shows the device. The pole changer generates impulses from the local battery which are stepped up by a transformer.

A patent granted to Mr. H. P. Clausen, of Chicago, describes a circuit for a subscriber's set for use with harmonic ringing systems. A three-way condenser is used in the receiver circuit. One leg is tapped to line, one to the receiver and the third to the bell, which is legged off to ground.

SERVICE METER SYSTEM.

For measured service the service meter is quite commonly used to count the connections. The meter is usually arranged to respond to a current controlled by a manually operated key. In this system, however, the inventor, Mr. R. H. Manson, of Elyria, Ohio, has arranged an automatic counter. The circuit is illustrated herewith. The left-hand cord is the answering cord. The meter is wired to the jack sleeve and fails to respond to the normal current which passes as the plug meets the jack. It will be seen that this current is controlled to some extent by the resistance. When, however, the relays have both oper-

ated their front contacts are in series and together complete a short-circuit around the resistance, which shunt contains a low-wound relay *R*. This not only causes an increased current through the sleeve circuit and thus through the meter, which then operates, but the relay *R*

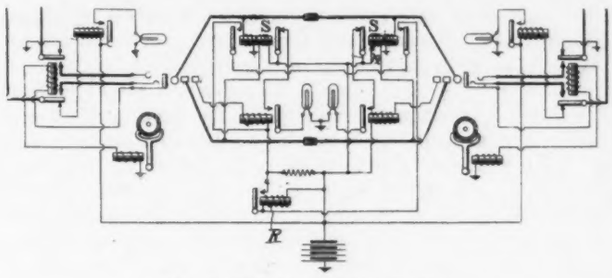


Fig. 2—Selective, Meter System.

responds and locks in the shunt so that the meter-operating current is maintained throughout the connection. It will thus be seen that a count is effected only from the answering cord after the called subscriber has answered and only one count is possible upon one connection. This patent is assigned to the Dean Electric Company.

Letters to the Editor.

Operation of Detectors in Wireless Telegraph Service.

To the Editor of Electrical World:

SIR:—In order to avoid a possible misunderstanding I should like to call to the attention of your readers an error in the article "Operation of Detectors in Wireless Telegraph Service," as published in the *Electrical World* of Dec. 30 last. Fig. 4, which shows a current calibration of the detector circuit in terms of axial displacement of the coupling transformer's primary, has as its ordinate scale "current in amperes." This should be "current in amperes $\times$ constant," since the exact value of the current through the detectors was not determined. In any event it is manifest that this could not be of the order indicated, namely, 200 to 400 amp. The factor to be applied is probably about 10^{-8}.

New York, N. Y. JOHN L. HOGAN, JR.

MECHANICALLY CHANGING RATE OF RADIOACTIVITY.

To the Editor of Electrical World:

SIR:—In your issue No. 1, Vol. 59, date of Jan. 6, 1912, a note appears (page 32) referring to my discovery of "what appears to be a change in the rate of emanation from uranium with mechanical rotation of the uranium mass." May I point out that the word emanation as now used by physicists has a special significance in radioactive literature, and refers to a gas given off or emanating from such highly radioactive matter as radium, but which has never yet been known to come direct from uranium in its natural state. May I also correct the statement in your note which refers to "the electricity *on* the belt of a small motor," etc., as this may impress physicists with the idea that I had, in some way, produced an electrostatic charge directly on the belt, as by friction; whereas it is distinctly otherwise, as I explain below. I may also say that the results in the experiments described were not unexpected, for I had made and filed a written signed statement (at the request of some widely known physicists) under date of Oct. 11, 1911, virtually stating that I believed a *change in the rate of radiation of the rays of radioactive matter could be caused by the mere act of revolving such a mass about an axis common to the mass.* I believe now I have seemingly, and probably in fact, so caused this change, which if not anticipated was certainly hoped for, for definite reasons given at some length in the above-mentioned statement.

The discovery mentioned in your note I prefer to designate as "mechanically changing the rate of radioactive radiation." I have tried several methods of revolution, but I intend to try others in the future, not only under very high speed, but relative to ionization and magnetic deflection under revolution. In a series of about 100 experiments, I used, so far as I know, the entirely new and original method of revolution of masses about a common axis, thus seemingly producing a change in the natural rate of radiation of any substance whatever; for I think there is a process of disintegration going on in the rotating atoms of every substance or element known to science, and that transformation of some kind is constantly—though very slowly—taking place in so-called matter of all kinds, instead of being confined alone to the present known radioactive substances. My recent experiments were with different substances, and all substances tried were affected by this peculiar revolution voltage. Ofttimes with substances of different densities—or specific gravities—I would get different results in terms of voltage at the needle, and not always would I get the same results with repetitions of experiments with the same substances; that is, the same averages of voltage as expressed at the needle of a Braun electroscope or voltmeter. I found that when I at one time discouragingly felt I must condemn my own findings I later obtained seemingly full and direct evidence of the actual powerful working of these revolution voltages really causing an actual dampening at the needle of the voltage from an induced field. That much seems reasonably certain after several experimental verifications.

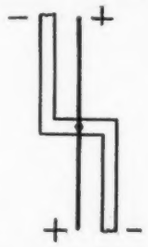
I mean by induced field, that may and may not have been wholly electrostatic, a field in space which acted inductively through an insulated copper wire loop generally, but not always, placed in that part of the field from which I could obtain the highest voltage at the needle of the electroscope or voltmeter, the cap of which was connected by a system of insulated wires and silver coils with the above-mentioned loop. To avoid repetition, I designated this field loop as "loop *L*," while another insulated wire loop, designated as "loop *U L*," was placed in space a distance of 1 cm, more or less, from the revolving mass, which in turn had an energy transmission loop *O L* connected to and revolving with it about a common axis—the axis of the spindle. The loop *U L*, like the loop *L*, was simply a bend in the insulated covered wire which returned upon itself from the loop, thus forming a double insulated wire for a comparatively short distance, where it divided, one portion leading to the cap of the electroscope but connecting to an insulated silver wire coil on the way. Loop *L* also ran double for a short distance, where it also divided so as to form a junction and a circuit with the system from *U L*. Thus I was enabled to mingle the induced voltages passing in the two-wire system before their resulting intensity of voltage, or resulting diminution of voltage, as the case might be, reached the needle with a definitely expressed result there of their differences or additions. These two looped systems were a practical result of necessity, because with a single loop only the indicated voltage often would send the needle up and out of the scale divisions of the arc on which these voltages were read. Following I give a description of one of the experiments:

Two separate masses of uranium ore were simultaneously revolved side by side about a common spindle axis, which axis was parallel with the distant axis of a ¼-hp motor. A small steel pulley was on each axis, a round leather belt connecting them. Loop *L* was generally—though not al-

ways—placed in free space between the top and bottom belt, and half-way from spindle axis to motor axis, or at "mid span." Sometimes this loop *L* would be located in free space opposite this mid-span station and well in from it toward the electroscope located on a table separated from the motor and spindle table. One of these separate masses, consisting of five lumps of uranium ore, had previously been cemented into the concavity of a lead paraboloid cup forming a circle whose plane was vertical to the spindle axis. The other mass—also of five lumps of uranium ore—was differently arranged, being fastened in a circle of insulated wire to the face of the rim of a wood drum open at its outer end and in which the lead cup was located, the axis of the spindle being also the axis of this drum. On the back of each of the five lumps of uranium ore in the lead cup had been laid a portion of the length of a thin narrow copper ribbon, and both were simultaneously pressed with cement into a sunken lead chamber in the lead paraboloid cup above mentioned. An exposed portion of the same copper ribbon was in each of the five cases turned down into the exposed concavity of this lead cup, all being equally visible with the exposed outer portion of each of the five uranium ore lumps. The loop *L*, now having been adjusted in the mid-span field and with loop *U L* at the side of the drum containing the two separate sets or circles of uranium ore above described, the motor power was turned on. Immediately the needle felt the differential electromagnetic (?) impulse or influence from the mid-field loop *L* simultaneously with that from the drum loop *U L*, and would stand for a fraction of a second before moving at all from its position at or near zero on the scale. Then, seemingly as if by an explosive release of atomic energy at the drum, the needle point would rush suddenly up to 200 or 300 volts, immediately fall to zero, and then at once begin steadily and rapidly to climb the arc of the voltage scale until it reached a maximum reading, when it would gradually change and begin to recede. There was nearly always a pulsing oscillation of the needle, when not spasmodically swinging violently back and forth, as it often did, through 200 or 300 volts or divisions of 100 volts each on the scale. This more steady pulsing was noticeable both in the rise and decline of the needle as it seemingly fought its way "inch by inch"—registering a change of 100 volts more or less during each half minute of the fifteen minutes which I allowed for each experiment from start to finish wherever on the scale it found the needle. By adding together those thirty or thirty-one different readings for each quarter-hour involved, an average voltage was obtained for each experiment. Call the average *A* for the one above described in which the two masses now, or as yet, are entirely separated though simultaneously revolved on the same axis. The fifteen minutes allowed for that experiment having expired, the power was shut off and the needle slowly fell to zero, or thereabouts, while preparation for the next following experiment was being made. In the case before us the copper ribbons, which had idly revolved with the inner circle masses of uranium to which each was attached as before described, were now connected to the outer circle masses of uranium by simply passing each ribbon separately over and approximately around the insulated wire circle connecting these outer masses, or masses on the outer face or edge of the drum rim. With the loop *L* and loop *U L* located undisturbed in exactly the position above described in the first experiment, and with the needle at or near zero on the scale, the power is again turned on, the needle's registry at every half-minute is again noted for another fifteen minutes, and, as before, the average of the voltage differentials is found. Call this average *B*.

The differences, *A* and *B*, between these two kinds of experiments were not always the same. Sometimes, in repeating the two experiments, they were more and at other times less. The crudeness of the temporized apparatus used for these preliminary experiments made a uniform or similarly close connection between the outer and inner masses with the copper ribbons impossible at any two succeeding tests. There was, however, always a difference. In the last experiment made at the laboratory, Jan. 4, 1912, the difference was an average of 83 volts greater when the two masses were ribbon-connected than when separated. But greater difference was shown by a much simpler arrangement or apparatus to be soon described.

There should always—as I later discovered—be made a comparison between the voltage of the maximum, or mid field alone, as found by loop *L* alone when no masses whatever are attached to and revolving on the spindle axis near loop *U L*, and the voltage due to the revolution on the spindle of any mass then to be compared. A less favorable showing is found by comparing the weaker *field* voltage at loop *U L* with the voltage from the *revolving mass* at loop *U L*. In this latter way I found, on Dec. 5, 1911, when I strapped the above identical and described five lumps of uranium ore—with their connecting circle of insulated wire—to the grooved edge of an old pine-wood disk, an average revolution voltage of *U L* to be 334.4 volts; and right afterward, with this entire disk, together with its uranium circle, removed from the spindle axis, I obtained the average voltage of the field at *U L* of 447.7 volts. Now, the difference between 447.7 and 334.4 equals 113.3 volts, which seemingly represents in actual voltage the *dampening* effect on the field at *U L*, as differentiated at once at the needle.



Charges on Indicating Needle.

and seemingly must be wholly due and completely due to the *revolving* of the uranium ore. What its dampening effect was on the maximum or mid-field voltage as drawn from the stressed ether there by loop *L*, I don't know, for I had not then found the comparative great importance of the mid-field voltage. The loops *L* and *U L* always should remain undisturbed in their original separate locations in each comparative experiment. But does not the needle indicate any change of its position from zero or show any voltage when the uranium ore, at rest on the unrevolving spindle, is allowed quietly to send in its radiation by way of the same loop *U L*? My answer is that I have not yet found any.

A number of other important observations and facts determined by this preliminary series of experiments cannot here be even touched upon. I however mention one other remarkable one, as follows: The aluminum needle was caused to become wholly and thus far permanently positive, and a small U-shaped magnet would attract alike either end of it, leading me to conclude that the upright aluminum frame or support for and closely parallel to the needle had oppositely become magnetically negative as shown in the accompanying cut. But I found repeatedly that, when the masses were revolving, the needle, while rising up the scale, was invariably negatively charged, and that it retained this negative charge during its slow fall until near its return to zero on the scale, when, and invariably, the positive character would again assert itself and become paramount, as though I had at will—though not knowing it then—caused a change in its innermost molecular, if not atomic, structure, by this revolution of the radioactive masses.

New York James Warriner Moulton.

Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

Generators, Motors and Transformers.

Practical Stray-Flux Calculations.—M. SCHENKEL.—An article giving formulas and tables for convenient practical use for making stray-flux calculations for all kinds of alternating-current machines. The author first gives formulas for the reluctances of the air along four different paths of the lines of flux. He then gives formulas for calculating the fluxes from the formulas. Finally formulas are given for finding the stray voltages from the fluxes. No derivation of the formulas is given, the chief object being the presentation of handy formulas ready for practical use. Many numerical examples are then given, illustrating the agreement between the formulas and results of experiments. Finally some points of the derivation of the formulas are briefly explained.—*Elek. u. Masch.* (Vienna), Dec. 10 and 17.

Diagram of Three-Phase Series Motor.—A. THOMAELEN.—An article on the way in which the stray fluxes must be taken into account in constructing the diagram of the three-phase series motor. With the aid of the self-induction and the mutual induction of stator and rotor the voltage diagram of the three-phase series motor is derived, and by changing the meaning of the vectors a current diagram is developed therefrom and a simple construction of both diagrams is described.—*Elek. Zeit.*, Dec. 28.

Deposits from Transformer Oils.—H. D. SYMONS.—The conclusion of his article in which he gives the results obtained with four different heating tests made to determine the liability of transformer oils to form deposits. The amount of discoloration and deposit varies with different oils, so-called blended oils being worse in this respect than the pure oils. It is probable that only a pure oil which will completely evaporate at a high temperature, leaving no residue, will fulfil the desire for absolute immunity from the formation of deposit. From the experiments and observations carried out by the author it is possible to judge how long oil will, under given conditions, remain free from the formation of deposit, and some have been tested that seem likely to be entirely free from the objectionable feature. Such oils can be obtained only by the most careful selection from the crude oil by distillation and refinement. Indeed, it is possible that care in distillation and refinement have a greater influence on formation of deposit than the crude material from which the oil was obtained.—Lond. *Elec. Review*, Dec. 29.

High-Speed Generators.—HANS BEHN-ESCHENBURG.—A paper giving a review of the chief characteristic mechanical and electrical features of modern turbo-generators.—*La Lumière Elec.*, Dec. 16.

Ball Bearings.—An illustrated article on the use of ball bearings in generators and motors with special reference to the construction adopted by a German company.—*Elek. Zeit.*, Dec. 14.

Lamps and Lighting.

Light Production.—R. A. HOUSTOUN.—The conclusion of his very long serial on different methods of light production. Progress has been made in three directions. First, in the direction of higher temperatures; second, in using substances with selective emission, and, third, by employing luminescence as well as temperature radiation. The superiority of the metallic-filament lamp over the carbon lamp is due partly to its higher temperature and partly to the shape of its energy curve. The efficiency of the Welsbach mantle is due, on the other hand, to its selective emission; the energy curve has two chief maxima, and one of them falls near the visible spectrum. The author doubts whether further progress can be made in pushing the temperature still higher since the temperature of the arc seems to be the practical limit. As to the possibilities of making use of selective radiation the author points out the facts about selective emission. The substances which show it in a marked degree are the oxides of the rare earths. If a combination of the rarer of these is found suitable, there will always be the expense and labor of purifying them, which is an extremely lengthy process. Again, all substances showing selective emission tend to radiate like the black body on being raised to high temperature, like the Nernst glower. In the chemical arc and in the mercury arc luminescence is combined with temperature radiation. The author then takes up the discussion of the vacuum tube, the Moore nitrogen tube lamp and the Claude neon tube lamp, and considers work in this direction as promising. He finally discusses fluorescence and the light of the firefly and suggests further research in this direction.—Lond. *Electrician*, Dec. 29.

Generation, Transmission and Distribution.

Comparison of Electric Winding Systems.—A. H. O. RENNER.—A paper read before the South African Institute of Electrical Engineers on a comparison of costs between the Ward-Leonard and the three-phase winding systems. While the great advantages of the Ward-Leonard system, particularly safety and ease of control, are generally admitted, its high first cost is often thought to be prohibitive. The author endeavors to show that, even granting that the first cost is higher than for the three-phase system, in very many cases this is largely counterbalanced by the difference in working costs. The paper contains a large number of comparative figures of cost.—*Transactions* South African Inst. Elec. Eng., September, 1911.

Condensation Losses.—G. AND J. R. WILKINSON.—An article on methods of dealing with losses in steam plant due to condensation. The authors emphasize the importance of removing the water of condensation regularly as it is formed, and of passing it back immediately at its highest temperature and in an uncontaminated condition through closed heat-insulated pipes direct to the steam generators. Several steam trap systems are noticed and discussed with special reference to the Losles system, which has been designed to overcome some defects in older systems.—Lond. *Electrician*, Dec. 29.

Tractive Force of Direct-Current Magnets.—KARL EULER.—An investigation of a solenoid-brake magnet of a German company of the type used for electric traction. The author first investigates experimentally the magnetic field of the magnet and measures the tractive forces and then in the second theoretical part discusses the relation between tractive force and field. Some practical conclusions are added on the predetermination of the tractive force of an electromagnet.—*Elek. Zeit.*, Dec. 14.

Traction.

Single-Phase Railway.—W. USBECK.—A description of the overhead catenary system employed by the Allgemeine Elektricitäts Gesellschaft on a portion of the Prussian State Railways between Dessau and Bitterfeld operated by single-phase current.—Lond. *Electrician*, Dec. 29.

Installations, Systems and Appliances.

Encouragement of Electric Lighting.—E. WIKANDER.—An article on a method in use in Gothenburg, Sweden, for the purpose of encouraging the use of electric light. The principle upon which this system, the so-called "free-

energy-for-one-year system," is based is the following: To every consumer who wires his house at his own expense energy is supplied free until the cost of the energy so supplied equals the cost of wiring. The time of such free supply is, however, limited to one year, and is made under the following conditions: That no electrical installation in the rooms in question has previously been connected to the supply mains (this is done to prevent old installations being replaced by new at the expense of the central station); that the new installation must have its own meter (this prevents unremunerative extensions to cellars, attics, etc., being made at the cost of the central station); that the cost of the installation to which free energy is to be supplied does not exceed $4 per lamp, or $13.40 per motor (this prevents large plants being included in the free-energy scheme); that a revenue of at least $1.34 per lamp and $5.36 per motor for the following year be guaranteed to the electricity works for each installation (this insures that the actual cost of the free energy is covered). These provisions apply only to lodgings, staircases, small shops and workshops, or to cases where the electricity committee is of opinion that such facilities will benefit the central station. This prevents new buildings which must have electric light being supplied with free energy. With such a system the revenue remains constant during the first year, while the kilowatts installed increase much more than in former years. But after the first year the revenue also increases at a greater rate than before. In the first year when the system was in use in Gothenburg the number of consumers increased by about 31 per cent, from 5980 to 7785. At the same time the number of lamps connected increased by 17.5 per cent, from 114,790 to 134,620. The financial results have been quite satisfactory.—Lond. *Electrician*, Dec. 22.

Austrian Central-Station Statistics.—L. Rosenbaum.—A further article giving some more analyses of the results of the last central-station statistics of Austria and Hungary. The total capital invested per kilowatt is given for water, steam and gas plants in Austria and compared with Switzerland in Table I.

TABLE I.—TOTAL CAPITAL INVESTED PER KILOWATT.

Rating of Plant.	Water.	Steam.	Water and Steam.	Gas.
Austria below 100 kw.....	$285 (82)	$380 (23)	$458 (32)	$493 (27)
Austria above 100 kw.....	259 (39)	299 (42)	260 (45)	324 (16)
Switzerland (year 1909).....	182 (89)	457 (5)	266 (63)	566 (13)

TABLE II.—TOTAL CAPACITY INVESTED PER KILOWATT.

Rating of Plant.	Direct Current Without Batteries.	Direct Current with Batteries.	Single-Phase.	Three-Phase.	Direct Current and Alternating Current.
Below 100 kw.....	$350 (45)	$508 or $369 (80)	....	$365 (21)	$504 (7)
Above 100 kw...	242 (5)	296 or 264 (54)	$264 (6)	244 (70)	265 or 235 (25)

The values are dollars invested per kilowatt, while the figures in parentheses are the number of stations for which the figure given is the mean value. Table II gives the total capital invested per kilowatt for different electric systems. In the figures for the direct-current systems where two figures are given the first figure (before "or") gives the dollars invested per kilowatt if the total rating is the rating of the generators alone, while for the second figure (after "or") the total capacity is figured as the aggregate rating of generators and batteries together. It will be seen that if the rating of the batteries is included in the total generating rating the cost per kilowatt is practically the same for the different electrical systems. Further data are given on rates and the fundamental rates charged per kw-hour. Most stations allow considerable discounts, down to 50 per cent of the fundamental rates, according to the number of hours of use per year. If the discounts are taken into consideration, the mean energy rate, or the receipt of the stations per kw-hour sold, is 7 cents (9 to 10 cents for lighting and 4 to 5 cents for motor service). A flat rate is used in about 30 per cent of all stations and is based in general on a yearly charge of 20 cents per candle-power for carbon lamps and 10 cents per candle-power for metallic-filament lamps. Further tables give information concerning the fuel cost and operating cost in general. Finally there is given a table which shows the direct and indirect and total costs of generation per kw-hour for different load-factors, according to Austrian practice.—*Elek. u. Masch.* (Vienna), Nov. 19.

Electrophysics and Magnetism.

Fatigue of Metals Subjected to Röntgen Radiation.—E. G. Rieman.—An account of an experimental investigation of the fatigue of metals subjected to Röntgen radiation in the presence of chemically active gases. Fatigue occurred when freshly polished surfaces of iron, copper, tin, lead and zinc were exposed to X-rays in the presence of oxygen or a mixture of oxygen and carbon dioxide. Aluminum showed no appreciable change. The fatigue for metals exposed in an atmosphere of pure oxygen was practically equal to that which occurred when 50 per cent CO_2 was present. It was also found that the changes in secondary radiation of all metals in chlorine and CO_2 were practically of the same amount, although the percentage of the mixture was varied through rather wide limits. Old oxide surfaces, which are stable so far as fatigue in an atmosphere of oxygen is concerned, showed decided fatigue when tested in chlorine. In the case of iron exposed in an atmosphere of chlorine and oxygen a double fatigue seemed to take place, one tending to increase and the other to decrease the radiation. Fatigue was found for metals with freshly polished surfaces when exposed in chlorine, bromine, nitric-acid fumes, hydrogen sulphide and hydrochloric acid. In some cases surfaces which had undergone a previous chemical combination showed a further combination and fatigue when exposed to another chemical agent and the X-rays. No relation has been found between the amount of fatigue for a metal and the corresponding activity of chemical action between the gas and the metal.—*Phys. Review*, November.

Radioactive Products in the Atmosphere.—S. Kinoshita, S. Nishikawa and S. Ono.—An investigation of the radioactive material deposited on a negatively charged wire from the atmosphere at Tokio, Japan. The decay curves show that the particles of radium A and thorium A are deposited on a negatively charged wire, but not other products, such as radium B, radium C, etc. Making several assumptions, the authors calculated the ratio of radium emanation to thorium emanation in the atmosphere at Tokyo. A fall in atmospheric pressure seems to have the tendency of increasing the amount of deposits. This, however, must be due to an increase in the amount of the emanations themselves.—*Phil. Mag.*, December.

Units, Measurements and Instruments.

Measuring Permeability by Alternating Currents.—R. Beattie and H. Gerrard.—An article illustrated by diagrams describing a new method of measuring permeability by means of alternating currents. The method depends essentially upon the fact that the hysteresis loss per cycle (provided the magnetizing current rises and falls continuously each half period) is determined by the maximum value of the flux or of the current. From the quotient of

the wattmeter reading by the frequency either of these quantities can therefore be deduced, and the other can be found by an appropriate ammeter or voltmeter reading. The wattmeter is used permanently in conjunction with an auxiliary iron ring for which a calibration curve connecting hysteresis loss with maximum flux or with maximum magnetizing current has been drawn up.—Lond. *Electrician,* Dec. 22.

Electric Meters.—K. SCHMIEDEL.—The first part of an article illustrated by numerous diagrams on friction in electricity meters, its determination, compensation and resultant errors.—Lond. *Elec. Review,* Dec. 22.

Electric Meters.—A. DURAND.—A paper from the Central Laboratory of Electricity in Paris. The author first discusses the different tests of meters made in a laboratory —that is, under most advantageous conditions. These tests include the influence of temperature, fluctuations of voltage, effects of friction, of external magnetic fields and of short circuits, the use of shunts, running at low load, effect of frequency and wave-form, effect of power-factor, use of transformers, effect of eddy currents, and errors due to faulty mounting of the meters. After taking up various special types of meters and discussing the starting current of meters, the author deals with the tests of meters in actual service and the accuracy which may be expected from the standard control instruments. The author thinks that in these times, when the sale of electrical energy becomes less and less remunerative, errors of 2 or 3 per cent in the measurement of the energy may bring about quite important financial results. The construction of good meters involves no difficulties but involves higher weight, greater volume and a higher price. The author criticises severely the policy of testing laboratories to indicate the errors of meters to thousandths or even ten-thousandths while the control apparatus have no such accuracy. The Central Laboratory of Electricity in Paris gives the results of its tests with an accuracy of ± five one-thousandths. A higher accuracy is not justified.—*La Lumière Elec.,* Dec. 9.

Electrostatic Instrument for Indicating the Voltage.—A description of a simple electrostatic instrument which has been placed on the market by a German company. It consists of an insulating cylindrical frame the front and the back of which are closed by glass plates and which contains a vertical metallic bridge which is in electrical circuit with the conductor when connected with it as shown in Fig. 1. Within this bridge there is an aluminum plate with a horizontal axle. When no current flows through the bridge this aluminum plate is in a vertical position due to gravity. But when the bridge holds a charge the aluminum plate is deflected as shown in the illustration. Depending on the voltage the angle of the deflection may be up to 90 deg. The apparatus is suitable for emfs of from 3000 volts to 75,000 volts.—*Elek. Zeit.,* Dec. 28.

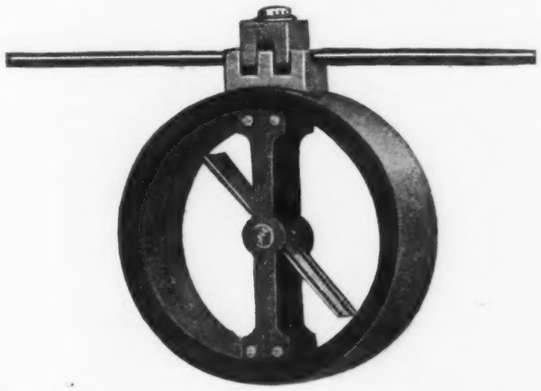


Fig. 1—Electrostatic Instrument for Indicating the Voltage.

Selenium.—LILAH B. CRUM.—An account of some characteristic features of "light-negative" selenium; that is, selenium which decreases the conductivity immediately upon exposure to light. From the experience of the author it seems that the preparation of light-negative selenium requires very particular conditions which were not ascertained after several months of effort. The resistance of the light-negative selenium is very unsteady, both in the light and in the dark. The change in conductivity of the light-negative selenium when exposed to light is very small, being less than 1 per cent. Some notes are added concerning exposure curves and recovery curves. The sensibility of the light-negative selenium seems to exist so close to the border line of sensitiveness that a slight stimulus will completely change its sign. The evidence indicates, but does not prove, that the negative effect is due to the selenium structure itself and not to an impurity present.—*Phys. Review,* December.

Gold-Leaf Electrometer.—J. C. HUBBARD.—An abstract of an American Physical Society paper. As shown in Fig. 2 a gold-leaf L is suspended in the electric field between two brass plates P and P, insulated from each other and connected to the terminals of a constant-potential battery of from 50 to 200 cells. The middle of the battery is earthed. The gold-leaf and the field-plates are inclosed in a brass case which is also earthed. Connected rigidly to the case is a framework into which a microscope may be adjusted so as to focus through a small glass window in the front of the case upon the edge of the gold-leaf. Coincidence of the image of a point in the edge of the earthed leaf with a cross-hair parallel to the image of the leaf in the microscope provides the zero of the instrument. The case, contents and microscope are capable of rotation as one body about a horizontal axis parallel to the axis of rotation of the leaf. When the leaf is charged the instrument is very convenient for the rapid measurement of the leaf until the image of the point in the edge of the leaf again coincides with the cross-hair; that is, until the leaf is in its original position with respect to the field-plates. Fine adjustment of the rotation is made by means of a tangent screw. If V is the potential applied to the leaf and a the angle through which the instrument was turned to bring the leaf to its initial position with respect to the field-plates, then $V = k \sin a$ where k is a constant depending on the design and adjustment of the instrument. The instrument is very convenient for the rapid measurement of potentials, the sensibility being almost instantly adjusted to any desired value by turning the graduated nut which raises or lowers the field-plates. Adjustment of the microscope to give an unchanged zero with the field on or off insures a perfectly definite sensibility for any reading of the nut. The instrument has a constant and very small capacity for any deflection.—*Phys. Review,* December.

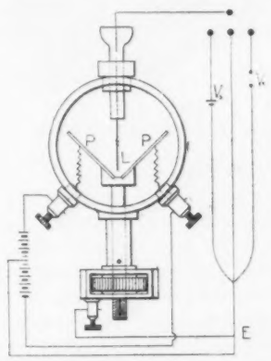


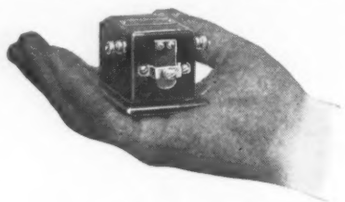
Fig. 2—Gold-Leaf Electrometer.

Magnetic Testing of Sheet Iron.—J. EPSTEIN.—An article in which the author replies to some criticisms by Gumlich and Rogowski of his method of measuring the loss and magnetization of sheet iron.—*Elek. Zeit.,* Dec. 28.

New Apparatus and Appliances

COMBINATION SPARK PLUG AND COIL.

The combination spark plug and coil made by the Connecticut Telephone & Electric Company, Meriden, Conn., and shown herewith is designed primarily for marine work, although it can be used on any form of engine fitted for jump-spark ignition. The plug is attached to the brass base on which the coil is mounted and the gun-metal cap which covers the winding and the core also houses the vibrator. The secondary windings of the coil are said to have more than twice the resistance of the usual marine-type coil. The spark plug itself is constructed on the petticoat prin-

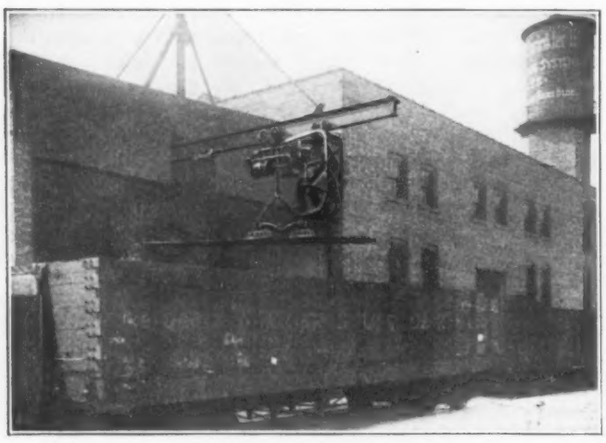


Miniature Spark Coil.

ciple connecting automatically to the secondary coil without wire connection. As will be noted, the mechanism is compact and convenient with just two primary wires, one from the battery to the coil and the other from the coil to the timer, the other battery lead connecting with the base of the engine. The advantage of the arrangement where water or moisture is present is apparent. When desired the coil is supplied attached with a switch with removable lever, so that while the switch lever is removed the ignition system is locked and the engine cannot be started.

LIFTING MAGNETS FOR HANDLING PIPE.

The most familiar form of the lifting magnet is of the large size (43-in., 52-in. or 62-in.) for use in the large plant for handling immense quantities of pig-iron, etc. It is usually assumed that a magnet cannot be employed efficiently in the small or medium-sized plant. There are, how-



Lifting Magnet Unloading Carload of Pipe.

ever, many interesting uses of smaller magnets of special type, and sheet metal, piping, etc., can be economically handled by magnets of proper design.

At the Chicago plant of the Rockwood Sprinkler Company two small 18-in. Cutler-Hammer magnets have been recently installed and have proved a valuable part of this well-equipped plant. The Rockwood company designs and assembles sprinkler fire-protective systems at this plant, the parts being shipped in "knock-down" form to be set up by construction gangs.

The illustration shows the magnets unloading steel pipe from a car, the trolley track extending over the railroad spur. From the cars the pipe is carried by the magnets into the storage house and deposited in proper compartments, according to size, ½-in. to 10-in. pipe being carried in stock. The crane operator alone can do this work, and as all the transporting is done from overhead no floor space is needed for trucking, and there is no interference with other work. The magnets operate steadily and noiselessly, accomplishing their work in quick time. Sprinkler equipments ready for shipment are also loaded by the aid of the magnets. The current taken by small magnets of this type is less than that required by the household electric iron, being for each of the 18-in. magnets used in this plant 1.9 amp at 220 volts.

LOCKED-BLADE DISCONNECTING SWITCHES.

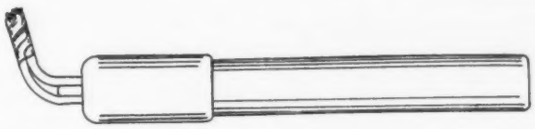
On systems subject to heavy current surges due to short-circuits, etc., it has been found that the intense magnetic fields generated will often cause ordinary disconnecting switches to come partly open. While this occurs only under abnormal conditions, it is very disastrous owing to the resultant arc between the blade and switch jaws. To meet the requirements of stations of large capacity where heavy short-circuits may occur, the Delta-Star Electric Company, Chicago, Ill., has developed the locking type of switch shown herewith. These are available in all capacities up to and including 10,000 amp, the larger sizes being provided with multiple blades. The contact jaws, as shown, are of the locking type. They can be easily closed, but require a positive, heavy pull to open them, guarding against accidental opening under abnormal conditions. In case a supporting insulator is broken during installation the defective part can be easily replaced. The conducting parts are mounted on special two-piece grip supports clamping the top of the insulator. By removing two bolts the switch can be quickly dismounted. In the type designed for mounting on side walls, here illustrated, the iron base can be removed and the insulator supports fixed directly to channel-irons or other flat supports. Another type of switch is

Locked-Blade Disconnecting Switch.

arranged to be mounted on standard 1¼-in. pipe work. The hinged blade has locking clamp nuts which will not loosen in spite of frequent operation. The switches have a high factor of insulation, insuring minimum trouble from break-down due to lightning or switching disturbances.

ELECTRIC LIQUID HEATER.

The liquid heater made by the Jupiter Electric Products Company, Cleveland, Ohio, is fitted with a current safety device which keeps it from being ruined if all of the liquid in which it is placed evaporates while the heater is in circuit. It will be noted from the engraving that the device itself is quite small in diameter, and one of the strong claims made for it by the manufacturer is the fact that it



Electric Liquid Heater.

can be inserted instantly in one glass or cup of fluid after another, as all that is necessary is to wipe it off each time it is to be introduced into a different liquid, which operation is easily and quickly performed. The device is nickeled and is especially adapted to dental use. It is also suggested for use in heating milk for infants, although it is serviceable wherever any liquid whatever is to be heated.

INCANDESCENT-LAMP GRIP.

In railway practice it is quite common, for instance, for the incandescent lamps to loosen and sometimes even to drop from their sockets owing to the constant vibration of the car and the natural tendency of the screw base of the lamp to unscrew under such conditions. In fact, vibration everywhere produces the same effect on threaded bolts unless they are fitted with devices such as lock nuts, etc., to counteract the effect. To prevent the inconvenience due to loosened lamps and also to prevent breakage, the device shown herewith is offered by the manufacturer, the Benjamin Electric Manufacturing Company, Chicago. The illustration is self-explanatory, the device possessing a spring means operating through slots in the threaded socket shell and engaging the lamp base with sufficient force to prevent

Incandescent-Lamp Grip.

the lamp from loosening and falling out. The Benjamin company is prepared to supply this lamp grip with its entire line of reflector sockets covering the range of lamps from 25 watts to 500 watts, and it is now adapting it to its other lighting units.

COMBINATION GRILL.

The "Radiant" electric grill shown herewith was designed to provide a flexible cooking device for the table, nursery or sick-room, or for use wherever desired, within reach of a lamp socket. It can be used for toasting, broiling, frying and boiling. In toasting, the slices of bread may be placed either above or below the radiant heater coil of "Calorite" wire. Protective gratings located on both sides of the

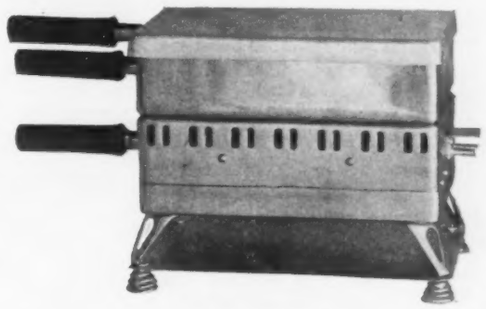


Fig. 1—Combination Grill.

heater coil prevent the substance cooked from coming in contact with the coil.

The lowermost receptacle is the broiler pan. This is provided with a corrugated metal rack, the design of which permits of the ready regulation of the distance of the food from the heater coil. The rack lies on the bottom of the broiler pan; in one position it holds the food away from the heater coil, and by simply turning the rack over the food is brought closer to the coil. The uppermost receptacle is the

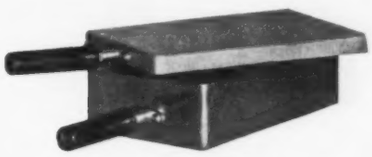


Fig. 2—Stew Pan and Cover.

stew pan, which is provided with a cover which can be turned over and used as a frying-pan or a griddle. This cover is made of aluminum and therefore does not require the use of grease for making pancakes.

The top of the stove containing the heater coil is hinged to the broiler pan. The hinges are of special design, permitting easy access to the pan below, or allowing the top of the stove to be entirely removed from the broiler pan for the convenient handling of the latter. The entire device

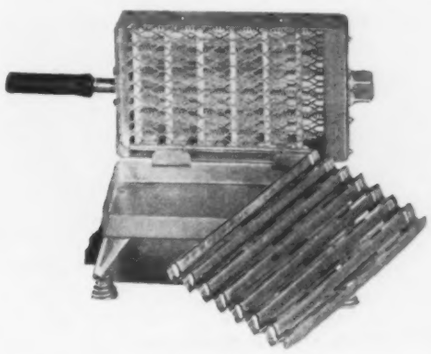
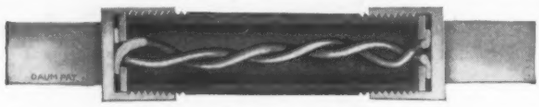


Fig. 3—Boiler Pan.

is finished in polished nickel and its neat appearance makes it a pleasing addition to the table, while its capacity of 600 watts adapts it for use on the ordinary lighting circuit. The device is manufactured by the General Electric Company, Schenectady, N. Y.

RENEWABLE CARTRIDGE FUSE.

In the refillable cartridge fuse illustrated herewith the fuse wire, in the case of the larger sizes of fuses, is passed through the shell and washer and the ends are bent in a curve over the washer. One cap is then screwed on tightly by hand and the shell filled with asbestos packing, after which the other cap is affixed in a manner similar to the first. The barrel of the cap is then placed in a pipe vise with the blade upright and the barrel of the other cap is turned by means of a pipe wrench until the caps are tight and the blades are in alignment. The soft fuse wire is thus forced to make a good wiping contact with the caps,



Refillable Cartridge Fuse.

as indicated in the engraving. The cartridge shell is, of course, designed to last for years so as to admit of any number of fuse renewals, and the time taken to effect a renewal is stated to be one-half minute for sizes up to 60 amp. In the smaller sizes the change may be effected with ordinary pipe pliers, and the expense in all cases is limited to the cost of the small piece of fuse wire and the small amount of asbestos packing required to fill the cartridge.

The fuse is manufactured by the A. F. Daum Company, Pittsburgh, Pa.

METALLIC-FLAME ARC HEADLIGHTS.

The accompanying illustration shows a metallic-flame arc lamp now being put on the market by the Westinghouse Electric & Manufacturing Company.

An advantageous feature of this type of lamp is that by reversing the direction of current through the electrodes by means of the plugs a dim greenish light is obtained which is very suitable for use on interurban cars traversing

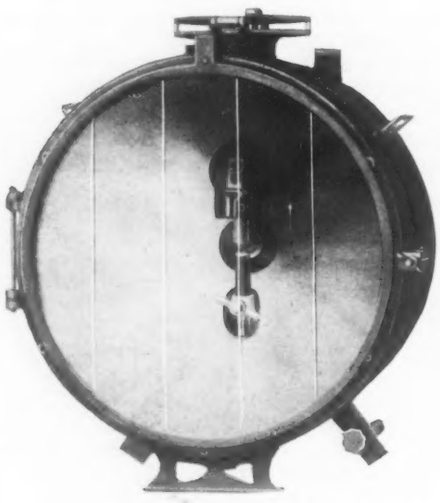


Fig. 1—Metallic-Flame Arc Headlights.

city streets. Metallic-flame arcs give much more light for the same expenditure of energy than do either carbon arcs or incandescents, and furthermore the light emitted is very penetrating, thus adapting them particularly for headlight service. The lamps are designed for use only on direct-current circuits the voltage of which is above 120. They take 4 amp and approximately 70 volts at the arc.

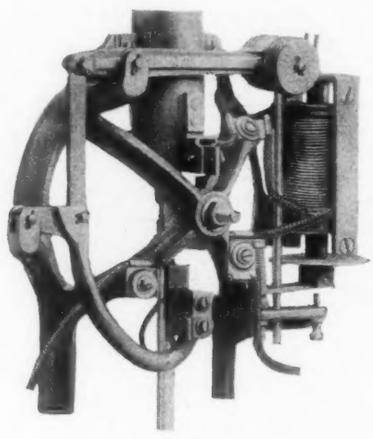
To reduce the line voltage to that required at the lamp terminals, and also for the purpose of steadying the arc, there is supplied a resistor consisting of grooved porcelain spools, around which a special wire is wound, all closed in a readily removable case. The wire is made of a non-corrosive alloy that will not be affected by continual changes in temperature, and the resistance is such that it can be readily adjusted to give the proper voltage at the lamp terminals with a range of line voltage from 325 to 600.

Essentially the metallic-flame arc headlight consists of a simple, rugged feeding mechanism, inclosed within a weatherproof case, arranged so to feed a metallic electrode that it will maintain a steady arc. Sheet iron is used in forming the body of the case, and the case rim and the door frame are brass castings. A hooded chimney is provided at the top and a hinged door at the bottom for inserting the negative electrode. Supporting brackets provided with hooks fasten the headlight to a car dashboard. The hooks engage over a loop of strap metal, which should be provided on the dashboard of the car, or they may hang on the upper edge of the dashboard. Two adjusting screws, which have rubber-covered bumpers arranged to bear against the dashboard, are attached to extensions at the bottom of the case. These are used for properly directing the beam of light.

The glass front consists either of flat sections, in which case a parabolic reflector of spun brass, heavily nickeled and highly polished, is used, or of a semaphore lens. In both styles the rays projected from the headlight are parallel.

The feeding mechanism consists of a solenoid with its winding in series with the arc, which, through a positively acting clutch and a series of levers, feeds the electrode. The lower or negative electrode is attached to a lever and is drawn toward or away from the stationary positive electrode by the movement of the solenoid and clutch. The clutch engages an auxiliary rod attached to an operating lever. No dashpot is required. By turning a screw the arc length can be adjusted.

The electrodes are similar in composition to those used in Westinghouse multiple and multiple-series metallic-arc lamps. The negative is about 5 in. long and ½ in. in diameter and is composed of certain metallic oxides. The positive is a metallic block. Negative electrodes have a life of



No. 2—Feeding Mechanism.

seventy to eighty hours and the positive electrode will last about 500 hours. They can be changed without removing the mechanism from the case. A particularly efficient application of this lamp is its installation on steam locomotives when used in connection with the small turbo-generator train sets.

COMMERCIAL ELECTRIC VEHICLES AT NEW YORK AUTOMOBILE SHOWS.

At the two automobile shows held in New York during the week eleven manufacturers of electric commercial vehicles made exhibits, nine at the automobile show in Madison Square Garden and two at the automobile show in the New Grand Central Palace. Pleasure and commercial vehicles were interspersed at the latter show, and at the Madison Square Garden show, which this week was devoted entirely to commercial vehicles, the electrics were accorded space on the first balcony. The features of the various commercial vehicles are outlined in what follows.

ANDERSON ELECTRIC CAR COMPANY, Detroit, Mich., had on exhibition 1-ton and 2-ton delivery wagons and a chassis for a 3000-lb. wagon. The Edison battery is used exclusively in these vehicles, and the motor is of the series-wound type of the company's own design and make. A continuous-torque, drum-type controller is used, with a wheel steering gear. The batteries are located under the wagon, and a double chain drive from a single motor is used. Expanding-band, ring-type brakes are used on the wheels and countershaft, and annular bearings are used on the motor and drive, with Timken bearings on the wheels.

ARGO ELECTRIC VEHICLE COMPANY, Saginaw, Mich., had on exhibition two wagons and a chassis. The 1000-lb. and 2000-lb. wagons are equipped with a herringbone gear direct drive from a single motor. The battery is suspended beneath the wagon, and the control is located on the steering mast, interlocking with a ratchet brake. The latter is of the double internal-expanding type and cannot be set while the power is on, nor can the power be applied while the brake is set. Any standard make of battery can be used in the vehicle. Ball bearings are used throughout.

BAKER MOTOR VEHICLE COMPANY, Cleveland, Ohio, showed a 4000-lb. express wagon and expected a chassis of a 4000-lb. wagon and a 1000-lb. delivery wagon, which were delayed somewhat in transit. The express wagon shown has a pressed-steel frame, with semi-elliptical springs and wheel steering gear. The brakes are of the internal expanding type on the rear wheels and internal expanding on the countershaft for emergency use. The motor is of the series type, rated at 4 hp, and the standard battery equipment comprises forty-two cells of Exide, although other battery equipment can be substituted. A silent chain drive is employed from the motor to the jack shaft and two roller chains from the jack shaft to the rear wheels. The wheels are fitted with Timken roller bearings, and ball bearings are applied to the motor and jack shaft. The battery is underslung in a cradle for side dismantling.

BRONX ELECTRIC VEHICLE COMPANY, New York City, showed a 1000-lb. chassis, a 4-ton chassis and a 1000-lb. delivery wagon. The frames are of pressed steel, and the wheel hubs are of special cast steel fitted with ball bearings. The latter are inclosed in dust-tight casings, running in heavy oil. A single 60-volt motor drive is employed on all sizes of chassis up to 10,000 lb., and the motors are equipped with ball bearings. The first reduction is by silent chain drive to the countershaft, housed in an aluminum casing with the chain running in oil, and the second reduction is by roller chain drive from the countershaft to the rear wheels. Any standard battery may be used with the equipment, the battery being underslung. The steering gear is of the irreversible type, with ball thrust bearings rigidly mounted on the chassis, and two sets of independently operated brakes form part of the standard equipment.

GENERAL MOTORS TRUCK COMPANY, Detroit, Mich., had a 3-ton chassis, a 1½-ton delivery wagon, a 6-ton truck and a 1½-ton English coach on exhibition. The vehicles of this company differ in design from the general run of commercial vehicles. The general differences comprise the method of mounting the battery and the drive. The battery box is a separate and independent unit of the chassis and is mounted in the front of the car on top of the chassis. It is so designed as to render every cell instantly accessible and plainly seen by simply lifting the seat and battery cover. It is also claimed that this method of mounting gives a better weight distribution than where the batteries are underslung from the frame midway between the wheels. The controller, switches, meters, etc., are all in the controller house at the front of the machine, where they can be instantly inspected by opening a door. A double internal-expanding brake equipment is used on the rear wheels and on the driving shaft. The countershaft is of the floating type, with non-adjustable ball bearings throughout. A spring-blade shaft connects the single ball-bearing motor to the driving gear, increasing the tire life and cushioning all violent strains in starting or stopping. The frames are designed to give great flexibility and to permit uniform load distribution for wide variations in loading space. Standard batteries are used and standard roller chains of ample size.

GENERAL VEHICLE COMPANY, Long Island City, N. Y., had ten trucks on exhibition; one 750-lb., one 1000-lb., one 2000-lb., one 2-ton truck, one 3½-ton truck, three 5-ton trucks, in addition to a 5-ton chassis and a 1-ton freight truck. In all of these vehicles the battery is underslung and double chain drive is employed from a single motor. The wagons of all sizes are built on a running gear of uniform design, which has been standardized, while the bodies are adapted to requirements of varied service. General Electric Company standard motors and controllers are employed, and the battery equipment is ample for a full day's work, while the vehicles are geared to travel at speeds consistent with modern ideas of quick delivery, but with due regard to the best results in the cost of upkeep. The controller is of the continuous-torque type, and the motor is equipped with ball bearings and is suspended on a cross-arm pivoted to the side frames in front of the rear axle. The countershaft consists of two short shafts connected by a differential of the spur-gear type, each shaft being connected to a rear wheel through sprockets and roller chain.

LANSDEN COMPANY, Newark, N. J., showed 1-ton, 2-ton and 3-ton trucks in addition to a 1-ton chassis. The standard chassis has a pressed steel frame and is fitted with Edison batteries which are underslung. A self-aligning countershaft with roller bearings and double-chain drive is connected by silent chain drive to a single motor. The Hinley steering head is employed. The design does not differ from that of previous years.

STUDEBAKER AUTOMOBILE COMPANY, South Bend, Ind., showed a 1000-lb. delivery wagon. The vehicles built by this company are characterized by a single motor suspended from the chassis frame and controlled by a continuous torque controller. Two brakes are provided, and a feature is the floating type of rear axle, which makes it possible to employ practically a solid rear axle to carry its share of the weight of the car. Its connection with the wheels is by means of a dog clutch fitted with a square socket, into which the squared end of the driving or floating axle is entered. The driving axle thus floats free in the housing and only comes in contact with the socket in the differential and the dog clutch at the wheel end. The battery is underslung and has independent spring suspension.

WARD MOTOR VEHICLE COMPANY, New York, had four vehicles on exhibition—one 700-lb. wagon, two 1000-lb. wagons and a 1500-lb. wagon. The battery in all wagons shown is underslung. The smallest wagon has a single motor with silent chain drive to countershaft and double roller chain drive to rear wheels. Two brakes are provided and a continuous torque controller. The steering gear is of the lever type.

WALKER VEHICLE COMPANY, Chicago, Ill., showed a 1000-lb. and 1½-ton wagon and a 750-lb. chassis. The

vehicles have a single motor housed in a hollow rear axle and one differential direct-connected to one end of a hollow armature shaft. Two drive shafts extend from the differential sockets into the center of each hollow rear wheel, with a pinion on the wheel end of each shaft. There are four idler gears and two rim gears; two idler gears in each wheel are mounted on the stub axle yokes, and the rim gears are fastened to the inside of the tire rims. The batteries are underslung.

Waverley Company, Indianapolis, Ind., had on exhibition a 3½-ton chassis and a 1-ton chassis, a 1000-lb. wagon and a 1500-lb. wagon, in addition to a combination pleasure and commercial car. In the lighter wagons of this company the motor shaft runs parallel with the rear wheel shaft and is connected thereto by means of herringbone gears. The battery is underslung. For heavier wagons chain drive is provided.

SUBSTITUTION OF ELECTRIC FOR GAS AND OIL AUTOMOBILE LAMPS.

The ability to light and extinguish lamps instantly without even slowing up the machine causes the electric light to appeal strongly to the automobilist, and the General Electric Company to meet a need is now manufacturing some devices which can be used to adapt gas or oil lamps for supporting electric lamps, the electric energy being furnished by a storage battery.

The bayonet-base socket bracket and 6-in. reflector for adapting gas lamps for electric ones is attached to the gas-pipe in place of the gas-burner, and is held there by means of brass nuts. The lamps may be focused by screwing the reflector forward or backward on the socket, the reflector being made accessible for this operation by merely opening the door of the outfit. The reflector is nickel-plated, highly burnished and in the form of a true parabola.

The bayonet-base candelabra socket for adapting oil lamps for electric ones is simple in design, can be readily attached to the oil burners without disturbing them, and can be so adjusted that when the bulb is removed the socket does not interfere with the oil flame.

The three-circuit snap switch, flush type, has a sturdy porcelain base, on the back of which are mounted the terminal plates and battery busbar with binding screw for each conductor. This switch is designed to go on the back surface of the dash or in some other convenient place, the switch handle being the only part which shows on the front. This switch may be wired to give the following combinations: first position, side and tail lights; second position, head and tail lights; third position, all lights on; fourth position, all lights off.

Extra terminal connections are provided so that if desired the electric horn and the speedometer light may be wired to it. The switch handle may be removed by turning it backward, thus preventing persons interfering or tampering with the lights on the car, which may be left standing unattended. The busbar feature eliminates all joints, splices, etc., and makes it a very simple matter to install.

Fig. 2—Single-Pole Flush Switch, with Lock and Key.

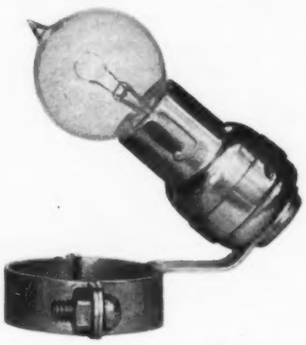


Fig. 3—Bracket and Socket for Automobile Lighting.

The flush tumbler switches, both on and off positions, are controlled by one and the same lever, thus reducing the number of levers and simplifying the control of the lights. The four-gang switch is recommended for five-light equipments, one switch being used for the tail light, one for the two side lights and one each for the headlights. The busbar feature is provided on two, three and four-gang switches, giving the same advantages as described above.

The surface tumbler switch is similar to the flush tumbler switch, with the exception that it is adapted for mounting on the surface, and requires that holes be drilled through the surface on which it is mounted for contact leads only. The push-button switch is designed for use where the space is very limited. The push-button is of metal, thus insuring that it will not break off. The plate on which the terminals and contacts are mounted is fastened to the frame with two long screws, effectually preventing its jarring loose. This switch has the busbar feature described above in connection with the tumbler switches.

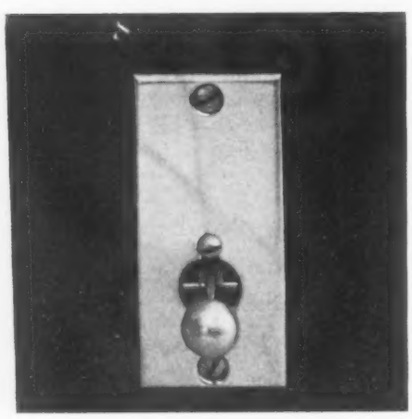


Fig. 1—Single-Pole Flush Tumbler Switch.

Fig. 4—Three-Circuit Snap Switch.

Fig. 5—Socket Bracket and Reflector.

Industrial and Commercial News

AMONG the important events of the week was a decision by the Supreme Court on Jan. 15 upholding the federal Employers' Liability Act of 1908, the court declaring that the law superseded all State statutes on the subject. Other government announcements included a statement issued on Jan. 17 by the Department of Commerce and Labor showing that exports from the United States for the calendar year 1911 amounted to $2,092,373,141, which was the largest total ever reported. Imports during the year were $1,532,931,861, and this figure is larger than that of any other year excepting 1910, when imports were $1,562,904,151. The excess of exports over imports was $559,441,080, and was the largest excess reported since 1908. General trade continues to show steady improvement in nearly all of its branches. Business with the steel companies is assuming very gratifying proportions, and the situation, as a whole, is regarded as satisfactory. Market quotations of telegraph securities showed no special change after announcement of Postmaster-General Hitchcock's suggestion of government ownership, noted elsewhere in this issue. Rates in the money market Jan. 17 were: Call, 1¾@2¼ per cent; ninety days, 3¼@3½ per cent.

THE COPPER MARKET.

There was very little buying this week in either the domestic or the foreign markets, and there was also a decided lack of inquiries. Prices in this country did not change appreciably during the week, and the majority of important agencies continued to quote electrolytic at 14½ cents per pound, delivered thirty days. Small lots were quoted by second hands at 14 cents to 14⅜ cents per pound, but there was little response. Prices on the London Metal Exchange declined on Jan. 15 to the lowest since the beginning of the year, standard showing prices of £2 7s. 6d. for spot, £2 8s. 9d. for futures and £2 15s. for best selected, under the quotations of Jan. 1. Recovery was made Jan. 16 upon publication of the fortnightly statistics giving the changes in the visible supply of standard copper in Great Britain and France in the first two weeks of 1912. This report showed a decrease of 1600 tons in foreign supplies, 400 of which were in stocks and 1200 in stocks afloat, the decrease leaving the total visible supply abroad on Jan. 15 at 55,950 tons. Exports from this country since the first of the month and including Jan. 17 aggregate 13,763 tons. The daily call on the Metal Exchange Jan. 17 quoted copper as per the accompanying table.

Standard Copper.	Bid.	Asked.	Settling Price.
Spot	13.95	14.05	.....
January	13.95	14.05	14.00
February	13.95	14.05	14.00
March	13.95	14.05	14.00
April	13.95	14.05	14.00
May	13.95	14.05	14.00

The London market, Jan. 17, was as follows:

	Noon. £	s	d	Closing. £	s	d
Standard copper, spot	63	0	0	62	16	3
Standard copper, futures	63	15	0	63	11	3

Extreme fluctuations in 1912:

	Highest.	Lowest.
Standard	14.00c.	13.87½c.
London, spot	£64 5 0	£61 17 6
London, futures	65 0 0	62 11 3
Best selected	68 5 0	66 10 0

INDUSTRIAL AND COMMERCIAL NOTES.

Allen & Peck Purchase a Virginia Company.—Announcement was made Jan. 14 that the firm of Allen & Peck, Inc., which has recently been organized under the laws of New York State to build, finance and operate public-utility properties, had secured control of the railway, gas, electric-light and ice companies in the territory of Newport News, Hampton, Phoebus and Old Point Comfort., Va. In addition to C. Loomis Allen, of Syracuse, and E. F. Peck, of Schenectady, Howell Griswold and John Opper, of Baltimore, and Charles D. Dickey and James May Duane, of New York, are interested in the new organization. The companies taken over were the Newport News & Old Point Comfort Railway & Electric Company, the Citizens' Railway, Light & Power Company, the Hampton Roads Traction Company, the Newport News Gas Company and the Distilled Ice Company of Virginia. The gross earnings of these companies for the year ended October 31, 1911, were approximately $650,000. The firm of Allen & Peck, Inc., was organized a few weeks ago, with Mr. Peck, general manager Schenectady Railways Company, as president, and with Mr. Allen, vice-president and general manager Syracuse Rapid Transit Company and Utica & Mohawk Valley Railway, as secretary and treasurer. These gentlemen, with Henry B. Boardman, vice-president Schenectady Trust Company, and John Rapelje, of Hopewell, N. Y., are the directors of Allen & Peck, Inc. The headquarters of the new firm for the present will be at Syracuse and Schenectady, but probably they will be moved later to New York. Messrs. Allen and Peck remain officers of the above properties in central New York, but expect to give considerable attention to their new undertaking, and later may find it necessary to devote all of their time to its affairs. The firm begins its career with strong banking connections and with officers of large experience in the engineering, financing and operation of public utilities, and should have a prosperous career, of which the purchase of the Virginia enterprise is just the beginning.

Western Electric Business in 1911.—Sales of the Western Electric Company in the year ended Dec. 31 reached a total, in round numbers, of $67,000,000, which is an increase of 6 per cent over the corresponding twelve months of 1910. If the 1911 figure of the Western Electric Company is not exceeded by that of the General Electric Company, the former will be the largest manufacturer of electrical apparatus in the world. Practically all of the ground lost after 1906 has been recovered by the Western Electric Company. It is of interest to note in this connection that the $69,000,000 business in 1906 was due in a large measure to great expansion in the telephone industry, while the 1911 total has been reached in a year of general business depression. A conspicuous feature of the 1911 business was a decrease in the average size of orders and an increase in the number of customers. Much attention was given by the company during the year to improving manufacturing methods, reducing the number of operations in turning out a given product, etc., and it was through economics effected by introduction of these efficiency methods that the company was able to offset many advances in cost of material and labor. The business of the company showed less depression in the Middle West during the year than in the East. About 24,000 people were employed by the company at the close of the year, and about 12,000 of these were at the Chicago plants, while the rest were distributed in the factories in New York and the thirty branches in the United States and the factories abroad.

Pennsylvania Railroad Electrification.—Rumors that the Pennsylvania Railroad is contemplating an electric train service between New York and Philadelphia were revived this week when it was learned that plans are to be prepared for electrification of the Broad Street station, Philadelphia. James McCrea, president of the Pennsylvania, made the following statement on the plans of the company to electrify its suburban service: "The question of electrifying the suburban trains has been considered in connection with the plans of the company for the betterment of its Philadelphia service and the changes about a station in the center of the city. I cannot say whether such a service, or any part of such a service, will be attempted soon, because nothing definite has been decided."

Water-Wheels for Keokuk Hydroelectric Plant.—In the issue of Jan. 6 it was stated in these columns that the 10,000-hp hydraulic turbines for the great Keokuk (Ia.) hydroelectric plant are being built in Cleveland. Of the fifteen turbines now under order, while seven are being built at Cleveland, eight are under construction by the I. P. Morris Company, of Philadelphia.

Annual Meeting of Columbus (Ohio) Railway & Light Company.—At the annual meeting of the Columbus Traction Company, the Columbus Light, Heat & Power Company and the Columbus Edison Company, all of which are underlying companies of the Columbus Railway & Light Company, all directors were re-elected. At the annual meeting of the Columbus Railway Company, which is another subsidiary and owns the greater part of the city lines, the board was increased to nine members and the following were elected: C. D. Hinman, Edward Johnson, George Hardy, W. C. Willard, F. R. Huntington and A. D. Heffner, all of Columbus; L. H. Matthews, of Springfield; Meade Massie, of Chillicothe, and William Worthington, of Cincinnati. Mr. Hardy was the only one re-elected. The others, it is said, were elected, in accordance with "peace plans," by stockholders' committees of the Columbus Railway & Light Company and the underlying company, the new directorate being independent of the former. The companies had disagreed concerning the proposed issuance of $1,000,000 stock by the railway company to compensate the Columbus Railway & Light Company for extensions and betterments.

Growth of Telephone Service in New York City in 1911.—The number of telephones in New York City increased about 10 per cent during 1911, bringing the total number of telephones now in service in the city to 440,000. These instruments are served through sixty-four central offices and are connected by 1,196,821 miles of wire. A number of improvements and conveniences were installed during the year, among which were the sending of telegrams by telephone and the installation of multi-coin prepayment instruments. About 4000 of these instruments have been installed in the last three months. Another innovation was in the method of calling Philadelphia subscribers over long-distance wires. Under the new method a New Yorker in getting a connection with Philadelphia simply asks for the Philadelphia number in the same way as that used in asking for a local connection, this method serving to reduce the time for making connections between New York and Philadelphia to less than one minute.

Commercial Cable Company Extends Half-Rate Zone.—The Commercial Cable Company has extended the zone for the transmission of the half-rate service that it recently put into effect between this country and Great Britain to include France, Germany, Portugal, India, Aden, Algeria, Ceylon, East Africa, the Gold Coast, Southern Rhodesia, the South African Union, Tunis, Zanzibar and a number of other Asiatic and African points. The conditions of acceptance of these half-rate messages state that the messages for these foreign points must be written entirely in the plain language of the country of origin, or in the language of the country of destination, or in plain French. These messages, it is announced, will be accepted at a 50 per cent reduction from the ordinary message rates and will not be subject to any artificial delay in transmission or delivery, unless such delay is caused by dispatching of ranking messages. It is understood that the delay will not be more than twenty-four hours in any case.

New York State Electrical Contractors.—New York State Electrical Contractors held their convention at the Building Trades Club, New York City, on Jan. 16. The greater part of the day was given over to closed meetings. In the afternoon a reception and tea were given at the Building Trades Club, which were attended by 200 guests, in addition to the members of the association present, who numbered about ninety. This was followed by a theater party at the Winter Garden, after which there was an automobile ride through the "Great White Way" to the Building Trades Club for supper and smoker. The members of the convention committee are Messrs. James R. Strong, chairman; Charles L. Eidlitz, John Livingston, E. S. Keefer and George Weiderman, secretary.

Will Improve Worcester (Mass.) Power and Traction Facilities.—Plans have been practically completed for an expenditure of $2,500,000 for increasing the power facilities and extending the lines of the Worcester Consolidated Street Railway Company in Worcester, Mass., and in Worcester County. The plans include a $500,000 development of the power station at Milburn so as to have a capacity to supply energy to all of the Worcester consolidated lines and other lines of the New England Investment Security Company connecting with the Worcester Consolidated. Another extension which is under consideration is a 25-mile trolley line, the cost of which is estimated at $1,000,000, to run between Paxton, Rutland, Coldbrook and Petersham. Consummation of these plans is contingent upon the action of the Legislature with regard to a bill filed by the New England Investment & Security Company to authorize a new corporation to be known as the Worcester, Springfield & Berkshire Street Railway Company, which would take over and operate all street railways controlled by the New Engalnd Investment Company and by the Berkshire Street Railway Company, now controlled by the New York, New Haven & Hartford Railroad Company.

Ford, Bacon & Davis Report on Annapolis Short Line.—It was learned last week that Messrs. Ford, Bacon & Davis, of New York, experts on electric railway operations, who were employed some months ago, as noted in these columns, to make a thorough examination of the property of the Annapolis Short Line Railroad, with a view to ascertaining the best method of operating the road, have completed their work and submitted a lengthy report, giving the result of their efforts. The contents of the report have not been divulged, but it is understood that the New York experts found the Short Line property in excellent physical shape.

Long Acre Company Buys Diesel Engines.—James F. Shaw, president of the Long Acre Electric Light & Power Company, of New York, has placed an order with the Busch-Sulzer Brothers-Diesel Engine Company, of St. Louis, for equipment for a new station, which is to be completed within five months. The initial installation will be a 3600-hp Diesel engine-driven unit. Mr. Shaw states that the policy of the company will be to install small generating stations in various parts of the city, instead of a large central station and substations. He hopes to have five or six plants in operation within a year, aggregating 25,000 hp.

New Power and Irrigation Project in Idaho.—The Crane Falls Power & Irrigation Company, an Idaho corporation, has awarded contracts aggregating close to $1,000,000 for the construction of a power station and concrete dam across the Snake River at Crane Falls, Idaho, and for construction of pumping stations and irrigation canals in the Gem irrigation district. It is said that Canadian capitalists are interested in the project, which will be one of the most important irrigation systems in the State of Idaho.

Financial.

Cumberland Telephone & Telegraph Bonds.—Banking interests are offering $1,000,000 first and general mortgage 5 per cent twenty-five-year bonds of the Cumberland Telephone & Telegraph Company, which was incorporated under the laws of Kentucky, June 8, 1883, and is a licensee of the American Telephone & Telegraph Company, which holds its control of the Cumberland company through stock ownership. The bonds offered are part of an authorized bond issue of $15,000,000, dated Jan. 1, 1912, and due Jan. 1, 1937, with interest payable Jan. 1 and July 1 in New York. The territory controlled by the company embraces Louisiana, Mississippi, Tennessee and Kentucky, southern Indiana and part of Illinois, or approximately 400,000 square miles. Over 90 per cent of the company's franchises are perpetual and unrestricted. The bonds are an absolute first mortgage on all of the properties of the company in the cities of Louisville, Knoxville, Chattanooga, Meridian, Jackson, Vicksburg, Shreveport and New Orleans, and are subject to a first mortgage of $725,000, due in 1918, covering properties in Evansville, Nashville and Memphis. Of the $15,000,000 bonds authorized, none can be issued except in exchange for the stock of the company, so the total $15,000,000 will probably never be issued, people preferring to hold their common stock, which is earning over 14 per cent. Earnings of the company are at a rate of about three and one-half times total authorized interest charged.

Winnipeg Electric Railways Gain.—The report of the Winnipeg Electric Company for the year ended Dec. 31, 1911, shows net earnings of $1,634,019, an increase of $4,511 for the year.

Milwaukee Electric Railway & Light's $90,000,000 Mortgage.—A general and refunding mortgage for $90,000,000 has been given by The Milwaukee Electric Railway & Light Company to the Bankers' Trust Company, of Milwaukee, as trustee. The mortgage matures Dec. 1, 1951, and covers three bond issues, to bear interest not exceeding 5 per cent. As security the company pledged all of its real estate, railway lines, rolling stock, plants, buildings, franchises and privileges, and also all property of the Milwaukee Central Heating Company. The first issue consists of the $3,000,000 5 per cent bonds referred to in the preceding issue as being offered for purchase. The second issue consists of bonds to the amount of $13,228,000. The third issue is for bonds to the amount of $73,772,000, to be executed by the company when it shall have made any permanent improvements or extensions in plants or property, provided the net earnings for twelve consecutive months immediately preceding the application be not less than one and one-half times the interest charged for the same period on all bonds already outstanding.

Montreal Street Railway Holding Company.—A plan of amalgamation of the Montreal Tramways Company and the Canadian Light & Power Company has been definitely decided upon. The amalgamation will be effected by a holding company taking up the common stock of the two companies to be absorbed. The holding company will be the Montreal Tramways & Power Company, with a London (England) charter and a capital of $20,000,000. The shareholders of the Montreal Tramways Company and the Canadian Light & Power Company will receive one and one-half shares of the Montreal Tramways & Power Company for each share now held by them. The holders of $2,000,000 of common stock of the Montreal Tramways Company will receive $3,000,000 stock of the consolidated company, and the holders of the outstanding $6,000,000 of Canadian Light & Power Company will receive $9,000,000 stock of the consolidated company. The Montreal Tramways & Power Company's outstanding stock will, therefore, be $12,000,000 of the $20,000,000 authorized.

Easton (Pa.) Gas & Electric Company's Holdings Sold.—The Eastern Pennsylvania Power Company, of Easton, Pa., has purchased the holdings of the Easton Gas & Electric Company at Easton, Pa., and Phillipsburg, N. J. The Eastern Pennsylvania Power Company is a consolidation of the Dover (N. J.) Electric Company, the Rockaway (N. J.) Electric Light & Improvement Company, the Bangor (Pa.) Electric Light, Heat & Power Company and the People's Consolidated Service Company. With its new acquisition the company now controls all the commercial electric light and power business in Easton and Bangor, Pa., Phillipsburg and Dover, N. J. The company has two generating stations in Easton and one each in Bangor, Pa., Dover and Bernardsville, N. J., and three hydroelectric plants in Easton, Stroudsburg and Columbia, N. J. Under the new consolidation the gas interests of the Easton Gas & Electric Company will be operated independently.

Boston Edison Secures Control of Weston Electric Light Company.—Control of the Weston Electric Light Company, which supplies energy to Weston, Sudbury and Wayland, Mass., has been acquired by President Edgar and associates in the Edison Electric Illuminating Company of Boston. The Weston company has an outstanding capital stock of $30,000, on which yearly dividends, at the rate of 10 per cent, are being paid. Its total assets are about $60,000. It is expected that the Boston Edison company will shortly make application to the Massachusetts Gas Commissioners for authority to purchase the property, and also that of the Hyde Park Electric Light Company. Control of the latter passed from the Massachusetts Electric Companies to President Edgar and his associates a short time ago, and new officers for the company were elected as follows: Charles L. Edgar, president; Thomas K. Cummins, vice-president; F. G. Havlin, treasurer.

Catskill Traction Company's Extension Approved.—The Public Service Commission of the Second District of New York has authorized the Catskill Traction Company to construct an extension of its trolley line from Leeds to Cairo, in Greene County, N. Y., a distance of approximately 7 miles. In granting approval of this extension the commission required that a stipulation be filed that the bond issue for the extension should not exceed $80,000, par value, or $11,900 per mile. The building of the extension was strongly opposed by the Catskill Mountain Railway, which parallels the extension, upon the ground that it would seriously damage existing property. The commission found that the steam road departs from the highway and that the proposed electric extension would be a convenience to local traffic along the highway, particularly during the winter.

Bell Telephone Returns.—The American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connecting independent or sub-license companies, report gross revenue for the eleven months ended Nov. 30, 1911, with all duplications excluded, of $163,686,329, an increase of $13,442,316 over this item in the corresponding period of the previous year. Net earnings were $46,966,141, a gain of $969,907. Interest was $12,534,923, an increase of $2,021,911, and dividends were $23,603,413, an increase of $509,475. The surplus was $10,827,805, a decrease of $1,461,479.

Issue of Securities Authorized by New York Public Service Commission.—The Public Service Commission for the Second New York District has authorized the Nassau Light & Power Company, of Mineola, N. Y., to issue $158,000 of its first-mortgage bonds, dated Oct. 1, 1907. The proceeds will be applied to improvements and additions to the properties of the company. The Central Hudson Gas & Electric Company will shortly issue $525,000 additional common stock for the retirement of bonds issued by the Poughkeepsie Light, Heat & Power Company, of Poughkeepsie, N. Y.

May Sell Electric Power Company, Ltd., of Toronto, Can.—Advices from Montreal state that the Electric Power Company, Ltd., of Toronto, Ont., which controls practically all the electric light and power companies in central Ontario, is likely to sell its interests to the Ontario Hydro-Electric Commission as a result of negotiations that have been in progress for some time with this object. It is stated that the company is not particularly desirous of selling, but that it does not wish to stand in the way of the Hydro-Electric Commission's plans for extension.

Financial Statement of Stone & Webster Engineering Corporation.—The Stone & Webster Engineering Corporation, of Boston, has reported its condition as of Dec. 11, 1911, to the Secretary of the Commonwealth of Massachusetts as follows: Assets—Real estate, $481,240; machinery, $29,889; cash and debts receivable, $744,544; securities, $304,750; total, $1,560,423. Liabilities—Capital stock, $500,000; accounts payable, $653,914; reserve for depreciation, $12,672; profit and loss, $143,837; floating indebtedness, $250,000; total, $1,560,423.

Receivership of Metropolitan Street Railway (New York) Ended.—The term fixed by Judge Lacombe of the United States Circuit Court in which to file objections to the sale of the Metropolitan Street Railway system to its bondholders expired Jan. 12. No protest having been presented, a special order approving the transfer to the new management was issued, thus closing the receivership of the Metropolitan Street Railway Company, which had figured prominently in the court since 1907.

Hall Signal Plan Forthcoming.—Edward P. Goetz, 42 Broadway, New York, secretary of the reorganization committee of the Hall Signal Company, intimated Jan. 17 that financial matters requiring attention the first part of the year have been occupying several of the committee, and that details of the Hall reorganization plan in consequence are not quite ready for announcement. The plants of the company, he said, are being operated at full capacity.

Detroit United Railways Has Record Year.—Both gross and net earnings of the Detroit United Railways in the year ended Dec. 31, 1911, were the highest in the history of the company. The balance available for dividends was slightly in excess of 13½ per cent on the $12,500,000 stock now outstanding, comparing with 11¾ per cent in the preceding year.

Portland (Me.) Light & Power Company Acquires Portland Railroad Company.—Arrangements have been completed for the sale of the Portland Railroad Company, of Portland, Me., to the Portland Light & Power Company, of the same city. An offer of $118 a share was made for all or for a majority of $2,000,000 stock of the railway company.

Niagara Falls Power Company's Report for 1911.—The pamphlet report of the Niagara Falls Power Company for the year ended Dec. 31, 1911, has been issued and gives the combined income account of the Niagara Falls company and the Canadian Niagara Power Company. Gross earnings for the year were $2,246,413, as compared with $2,203,134 in 1910. The surplus before dividends was $686,923, as compared with $665,061, and is equal to 11.92 per cent on $5,760,200 capital stock, as compared with 15.83 per cent on $4,200,000 outstanding capital stock in the previous year.

MARKET PRICES.

	Jan. 10.	Jan. 17.		Jan. 10.	Jan. 17.
Allis-Chalmers	1	1*	General Electric.....	159	159¾
Allis-Chalmers, pf...	8*	8*	Mackay Companies..	78*	78
Amalgamated Copper	66	65⅛	Mackay Cos., pf....	69*	69*
Boston Edison.....	297	296*	Philadelphia Elec...	17⅜	17⅝
C'monwealth Edison.	139	138	Western Union....	81	84¾
Elec. Storage Bty..	53½	53¼*	Westinghouse	71¾	73¼
Elec. Stor. Bty., pf.	30*	30*	Westinghouse, pf....	117½	118*

Personal.

Mr. Sam A. Hobson, of the Wesco Supply Company, has been elected president of the St. Louis League of Electrical Interests.

Mr. W. P. Carstarphen, Jr., is the author of an article on the electric truck in a symposium printed in the Denver *Post* of Jan. 8 on future advances in various lines of human endeavor.

Mr. Harry B. Logan, president of Dossert & Company, sailed from New York on the S. S. *Almirante* on Jan. 17 for a trip to the West Indies and Central America, taking in the Panama Canal.

Mr. J. Walter Gillette, general manager of the Fort Smith (Ark.) Light & Traction Company, received as a Christmas token from his employees a handsome gold watch with Swiss movement and striking attachment.

Mr. E. W. Lloyd, general contract agent of the Commonwealth Edison Company, Chicago, is enjoying a short winter vacation as a member of a party of Illinois manufacturers and business men that is visiting the Panama Canal.

Brig.-Gen. George H. Harries, president of the Louisville Lighting Company, contributed $250 personally last week to the "commissary relief station" established in Louisville during a recent period of cold weather by John and James Whallen.

Mr. Guy Eastman Tripp.—In a personal item published in this column last week Mr. Tripp's Christian name was given as George, the error being detected too late for correction in that issue. The correct name is as given at the head of this note.

Mr. Andrew Patterson, electrical superintendent of the Fort Smith (Ark.) Light & Traction Company, was presented with a pair of diamond-studded cuff links and a set of automobile tools, the gift of his employees, on the opening of the latter's new clubrooms at Fort Smith.

Mr. J. H. Siegfried has resigned as superintendent of the light and power department of the city of Winnipeg to accept a position with the Pacific Power & Light Company as superintendent of power. In this position Mr. Siegfried will have jurisdiction of all generating stations, transmission lines and substations owned by the company in Yakima, Walla Walla and Columbia River valleys.

Mr. Lincoln S. Riley, formerly superintendent of the Housatonic Power Company at New Britain, Conn., has been made superintendent at New Britain for the United Electric Light & Water Company, which has taken over the electric-lighting business at Waterbury, Watertown, Cheshire, New Britain, Newington, Plainville, Southington, South Norwalk, Wilton, New Canaan, Weston and the gas and electric business at Naugatuck, Norwich and Greenwich.

Mr. Frederick W. Ballard, manager of the engineering and construction department of the Sherwin-Williams Company, Cleveland, has been appointed constructing engineer of a municipal electric-light plant to be built by Cleveland at an estimated cost of $2,000,000. Mr. Ballard is secretary of the Cleveland Engineering Society, past-president of the Ohio Society of Mechanical, Electrical and Steam Engineers, member of the American Society of Mechanical Engineers and of the American Institute of Electrical Engineers.

Dr. Ignax Shilowsky, of Aix-la-Chapelle, has recently joined the special student entourage of the Massachusetts Institute of Technology at Boston for the purpose of conducting research leading to the purification of fused copper slags by electrolysis. He has lately been carrying on investigations in his home city in relation to the electric smelting of copper ores and the refining of impure metallic copper. Dr. Shilowsky will be occupied for several months in the Boston investigation and before returning to Europe will visit some of the large copper smelting works of the West.

Mr. Rodney Hitt has resigned as associate editor of the *Electric Railway Journal*, to become connected with White, Weld & Company, bankers, New York. Mr. Hitt, who is a graduate of Purdue University, began his editorial career on the *Railroad Gazette*. He is the author of several dictionaries relating to steam and electric railway equipment, which have been notable contributions to industrial literature. The departure of Mr. Hitt from the electrical journalistic field is a severe loss, but the wide knowledge he acquired therein qualifies him for an equally successful career as an expert in relation to the appraisement and economics of electric railway properties.

Mr. E. F. Peck, who has just been elected president of the firm of Allen & Peck, Inc., was one of the pioneers in the electric railway and lighting industry. He is a native of New Britain, Conn., where he was born in 1861. His first connection with the electrical business was in 1880, when he joined the American Electrical Company, in New Britain, which subsequently became the Thomson-Houston Electric Company. For it Mr. Peck installed a number of its first electric lighting plants, as in Boston, Fall River, Lynn, Mass.; St. Louis, Mo., and Brooklyn, N. Y. He also had charge of the early exhibits of the company at different national expositions. In 1885 he became general manager of the Citizens' Electric Illuminating Company, Brooklyn, N. Y., and in 1899 of the Kings County Electric Light & Power Company of Brooklyn. He resigned his position in 1902 to become general manager of the Schenectady Railway, which position he still occupies. Mr. Peck has taken a prominent part in association affairs, and in 1909-10 was president of the Street Railway Association of the State of New York.

Mr. Van Rensselaer Lansingh, the newly elected president of the Illuminating Engineering Society, was born in Albany, N. Y., in 1873. He attended the College of the City of New York, the University of Chicago and the Massachusetts Institute of Technology, having specialized in mathematics, physics and electrical engineering. He has been associated with the Western Electric Company in engineering work. In 1901 he engaged in consulting and contracting electrical engineering in Chicago, and in the same year announced the beginning of professional practice as an illuminating engineer. Late in that year he took the agency for the Holophane Glass Company for Chicago, and later for all of the territory west of the Appalachian Mountains. In 1904 Mr. Lansingh was made general manager of the sales department of the company with headquarters in New York. At present he is general manager of the firm which is known as the Holophane Company. Mr. Lansingh has contributed a large number of articles to the technical press and has read many papers before various engineering societies. He was the first treasurer of the Illuminating Engineering Society in 1906 and was again elected treasurer in 1911. He was general secretary of the society in 1907 and 1908 and vice-president in 1910 and 1911. He was the co-author with Mr. J. R. Cravath of a book on "Practical Illumination"

VAN RENSSELAER LANSINGH.

which was the pioneer publication in its line. Mr. Lansingh became an associate of the American Institute of Electrical Engineers in 1899 and was transferred to full membership in 1907.

Mr. C. Loomis Allen, whose firm, Allen & Peck, Inc., has just purchased the public-utility properties at Old Point Comfort, Va., and has announced plans for embarking in the management of public utilities elsewhere, has taken a very prominent part in the operation of electric railway properties since 1895 and in association affairs. Mr. Allen is at present vice-president and general manager of the system of city and interurban railways centering in Syracuse and controlled by the New York Central & Hudson River Railroad. He began his electric railway career as civil engineer of the Syracuse city lines. In 1898 he was promoted to the office of assistant general manager and a year later he became general manager of the system. In 1900 he resigned to become general manager of the Lorain Street Railway in Lorain, Ohio, but in the following year he returned to central New York to become general manager of the Utica & Mohawk Valley Railway. In 1906 the Syracuse Rapid Transit system was acquired by the same interests and Mr. Allen was appointed manager of the combined properties. In addition to his operating duties Mr. Allen has served on many important committees of the National and State associations. He was the first president of the American Electric Railway Transportation & Traffic Association, and he was president in 1904 of the Street Railway Association of the State of New York. He is now third vice-president of the American Electric Railway Association.

Mr. Frederick L. Hutchinson, who was unanimously appointed secretary of the American Institute of Electrical Engineers at the meeting of the board of directors of the Institute held on Friday, Jan. 12, was born in Elizabeth, N. J., and began his business experience in the service of the Pennsylvania Railroad Company, in one of its largest freight offices in New York City, where he had several years' experience in accounts, correspondence and general office work. In 1889 he resigned to enter Cornell University, in the electrical engineering course. Immediately after graduation in 1893 he entered the employ of the Westinghouse Electric & Manufacturing Company. After several years' experience in the manufacturing, testing, drafting and sales departments, he was transferred to the publication department, where for a number of years he had charge of the preparation and publication of the technical literature of the company, including numerous articles for the technical press. In 1901 Mr. Hutchinson resigned his position with the Westinghouse company to become manager of the publication department of the C. W. Hunt Company, Staten Island. He resigned this position the following year to go with the National Electric Company, of Milwaukee, as advertising manager, and a year later he was made manager of electrical sales for the same company. In 1904 Mr. Hutchinson returned to New York and undertook some special work on the *Transactions* of the American Institute of Electrical Engineers. Gradually the scope of his work was increased in other directions, until in February, 1908, upon recommendation of Secretary Ralph W. Pope, he was appointed assistant secretary by the board of directors. Upon Secretary Pope's resignation, after twenty-seven years of service with the Institute, Mr. Hutchinson was, in August, 1911, appointed acting secretary by the board of directors, and his recent promotion to the post of secretary is evidence of the manner in which his duties were performed. Mr. Hutchinson has served from time to time upon various Institute committees and has rendered valuable services to many other committees. His work during the past few years in connection with the various activities of the Institute has steadily increased. He is thoroughly familiar with the history and policy of the Institute; the duties, scope and limitations of its numerous committees and representatives, and the relations of the Institute to other engineering and scientific organizations both in this country and abroad.

FREDERICK L. HUTCHINSON.

Obituary.

Mr. Richard T. Crane, president of the Crane Company, manufacturer of pipe fittings and steam specialties, died at his home in Chicago on Jan. 8. Mr. Crane, who was a very wealthy man, was nearly eighty years old. He was a "self-made" man and was widely known for his warfare on college education for young men preparing for industrial or commercial pursuits. A pleasing characteristic was his kindliness to the men employed by his company, and for a number of years he had distributed annual bonuses ranging from 5 to 10 per cent of the earnings of all employees. Mr. Crane advocated "practical" manual training, and one of the manual-training schools of the Chicago public-school system is named after him.

Mr. Charles I. Young, regarded by his associates in the Westinghouse Electric & Manufacturing Company as the dean of the sales educational work, died Saturday morning, Jan. 6. Mr. Young had been failing in health for a year past, and in November he sought to improve his condition by going to a sanitarium for treatment. Owing to an electric shock of 2500 volts received in 1888 he was for three years following that accident incapacitated for work. During this same period he suffered for a time with malarial fever. In 1891 he returned to Pittsburgh to continue his services with the company, and, while physically he was weak and partially dependent upon the help of another, his keen insight into human nature and his knowledge of the electrical business from the beginning fitted him exceptionally for work in the sales department as an advisory engineer, first in the Philadelphia office, later in the expert department, and finally at East Pittsburgh. On the inauguration of a commercial training department in the sales organization of the electric company a few years ago he was made the instructor. Classes from time to time are formed from the district offices of the company and brought to headquarters to be made acquainted with the latest development of the apparatus and with the methods of selling. It appeared to his many friends that in this latter work he realized to the fullest extent his ambition to serve best the interests to which he had been attached for so long. His pleasing personality, coupled with a mind keenly attentive to every point of human nature, made him a magnetic force wherever he mingled with men, and it is pleasing to record that every class which came to Pittsburgh, before breaking up to return to active work in the field, left a testimonial of one kind or another expressive of the high esteem in which he was held. Because of his physical affliction he must undoubtedly have suffered a great deal, yet with it all he smiled through it and proved himself at all times a living benediction. Mr. Young was graduated from Princeton in the class of 1883, following which he was employed by the Edison Machine Works at New York testing generators during 1884 and 1885; later he was superintendent of the Edison Illuminating Company, following which he became attached to the Westinghouse interests in the fall of 1886. Mr. Young is survived by his brother, Captain F. A. Young, an attaché of the United States Weather Bureau at Washington. The funeral took place on Jan. 9 from the Shadyside Presbyterian Church, Pittsburgh.

CHARLES I. YOUNG.

Construction.

KINGMAN, ARIZ.—The Santa Fe Co. is planning to utilize electricity in all its buildings and yards here, which will be supplied by the Desert Pwr. & Wtr. Co.

PHOENIX, ARIZ.—Application has been filed with the City Council for permission to erect 50 additional arc lamps in certain sections of the city.

PHOENIX, ARIX.—The Phoenix Ry. Co. of Arizona has filed a mortgage to secure a bond issue of $1,250,000. The company is planning to double-track its First Street line and will extend its Second Street line about 5 miles.

PHOENIX, ARIZ.—The Reclamation Service has commenced the erection of a transmission line for the Salt River Valley Water Users' Association from the Roosevelt power plant, South Canal, to the Mesa City switching station, a distance of 8 miles. I. C. Harris is engineer in charge.

BLUE LAKE, CAL.—The Western States Gas & El. Co. is connecting the electric plant of the Minor Mill & Lumber Co., recently acquired with its general system. Improvements, it is said, will be made to the plant. H. L. Jackson is manager.

CARRVILLE, CAL.—The Headlight Mining Co. is planning to erect a hydroelectric power plant on Coffee Creek.

GAS POINT, CAL.—The Gas Point Tel. Co. will connect the local system with the lines of the Pacific Tel. & Teleg. Co. at Cottonwood, a distance of 15 miles.

GLENDALE, CAL.—Preparations are being made to extend the municipal electric-light system to the Piedmont Park district. H. B. Lynch is manager of the municipal electric plant.

GREENWOOD, CAL.—The L. E. Lumber Co. is planning to install an electric power plant. C. F. Flinn is manager.

HAYWARD, CAL.—The Pacific Gas & El. Co. contemplates the erection of a transmission line on the western side of Castro Valley to supply electricity for lamps.

HEMET, CAL.—The Southern Sierra Lt. & Pwr. Co. is planning to extend its transmission lines to San Jacinto and Hemet as soon as its work in Perris is completed. Later the company will extend its lines in other directions.

JACKSON, CAL.—The Eagle Gold Mining Co. contemplates the installation of electric hoisting machinery.

LONG BEACH, CAL.—The Southern California Edison Co. has commenced the erection of a new aluminum transmission line from Long Beach to Puente, via Fullerton and Anaheim, a distance of about 45 miles. The line will carry 60,000 volts and replace the copper line carrying 32,000 volts.

LOS ANGELES, CAL.—A mortgage has been recorded by the Pacific Lt. & Pwr. Co. for $35,000,000, to secure funds for meeting obligations and for extensions to its property.

LOS ANGELES, CAL.—The Board of Public Works has authorized the Los Angeles Gas & El. Co. to install 100 new arc lamps in the Wiltshire and Hollywood districts.

LOS ANGELES, CAL.—The Eagle Rock district has annexed a new street to be known as Colorado Avenue. A contract for lighting that thoroughfare and other streets of the town has been awarded to the Eagle Rock Lt. & Wtr. Co.

LOS ANGELES, CAL.—An electric-light and power plant will be installed in the new hotel building to be erected on Hill Street by E. P. Clark, plans for which are being prepared by Harrison Albright, architect, Laughlin Building, Los Angeles.

LOS ANGELES, CAL.—The City Council has approved specifications for the installation of a fire and police signal system and will soon call for bids. The system will consist of 1000 boxes for fire service and 500 boxes for police signal system and will cost about $500,000.

McKITTRICK, CAL.—The San Joaquin Lt. & Pwr. Co. will begin work on the installation of a street-lighting system here. The company has completed surveys for a new transmission line to extend from Bakersfield to Tojon Canyon, via the Sunflower and Towne districts.

NEVADA CITY, CAL.—The Pacific Gas & El. Co. is planning to abolish its flat-rate system at Nevada City and Grass Valley and will soon install electric meters. It is understood that tungsten lamps will be used.

NICOLAUS, CAL.—J. W. Wright & Co., of San Francisco, have acquired a tract in Nicolaus, which will be irrigated by a system of motor-driven pumps, electricity for which will be furnished by the Pacific Gas & El. Co.

OAKLAND, CAL.—Investigations are being made by Commissioner of Public Health and Safety F. C. Turner with a view of municipal ownership of a distributing system for street lighting. Estimates are being prepared by George Babcock, city electrician, of the cost of lighting by electroliers, arc lamps, tungsten and gas lamps.

OROVILLE, CAL.—The Oroville El. Corp. will soon begin work on the erection of a transmission line from Pentz to Sacramento, via Oroville and Marysville, a distance of about 90 miles. The line will be tied in with the proposed power plant in Humbug Valley.

PASADENA, CAL.—The Pacific El. Ry. Co. has been granted a 30-year franchise for a street railway on Washington Street, from the city limits to a point west of Santa Anita Avenue.

ROSAMOND, CAL.—The Gold Rocks Mines Co. is planning to install an electric plant at its properties in connection with a new milling plant. Gas producers and gas engines will be used. Charles Poore is president and engineer.

SACRAMENTO, CAL.—The Board of Trustees has voted to install 25 new arc lamps in various parts of the city.

SACRAMENTO, CAL.—The City Trustees have accepted the bid of the Pacific Gas & El. Co. for lighting the city during 1912 under which the company will furnish arc lamps at $6 each per month and electricity for electroliers, carrying five lamps each, at $4.40 each per month.

SAN DIEGO, CAL.—The San Diego Con. Gas & El. Co. is planning to install a 3000-kw steam turbo-generator and to increase the boiler capacity of its generating plant during the coming year. Its transmission lines will be extended from La Jolla to Del Mar and from Lemon Grove to Encanto, a total distance of about 15 miles.

SAN FRANCISCO, CAL.—The Board of Supervisors has appropriated $12,400 for the installation of a police-signal alarm system in the business district.

SAN JOSE, CAL.—The Great Western Pwr. Co. has been granted a franchise to erect transmission lines through Santa Clara County.

SANTA MONICA, CAL.—The Southern California Edison Co. is planning to rebuild its local system to comply with the new state laws, at a cost of about $30,000.

SOUTH PASADENA, CAL.—The Home Tel. Co. is said to be planning to erect an independent exchange in South Pasadena.

WHEATLAND, CAL.—The Pacific Gas & El. Co. is planning to extend its transmission lines through the colonized lands south of Wheatland to supply electricity for lamps and motors and to operate pumps for irrigation purposes.

WILLOWS, CAL.—The capital stock of the Glenn County Tel. Co. has been increased from $100,000 to $200,000. The company proposes to extend its system to Sacramento, San Francisco and vicinity in conjunction with the Postal Teleg. & Cable Co. C. L. Donohue is president and W. H. Travis manager.

CANON CITY, COL.—The construction of an electric railway from Canon City to the top of Royal Gorge is under consideration. E. B. Street, 88 Wall Street, New York, N. Y., is interested.

COLORADO CITY, COL.—The Business Men's Association has appointed a committee to make investigations in regard to the cost of establishing a municipal electric-light plant.

PUEBLO, COL.—A trust deed has been recorded by the Arkansas Valley Ry., Lt. & Pwr. Co. to secure an issue of $10,000,000 in bonds. The company was organized to build an electric railway through the Arkansas Valley and to carry on irrigation projects. Bonds to the amount of $6,647,000 will be issued at once.

HARTFORD, CONN.—Plans are being considered for the installation of a new street-lighting system in the business district.

NEW HAVEN, CONN.—Revised estimates are being prepared of the cost of equipping the New York, New Haven & Hartford R. R. Co.'s railroad between Stamford and New Haven for electrical operation.

WASHINGTON, D. C.—The District of Columbia appropriation bill provides for an appropriation of $10,000 for preparing plans and specifications for the construction of a power plant at Great Falls to supply electricity to the District. The Secretary of War is directed to make investigations through the engineer corps of the army.

WASHINGTON, D. C.—Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Jan. 30, to furnish at the navy yard, Brooklyn, N. Y., supplies as follows: Schedule 4249—generating set; schedule 4250—wireless-telegraph sets; schedule 4254—receivers and transmitters, etc. Applications for proposals should designate the schedule desired by number. T. J. Cowie is paymaster general, U. S. N.

MADISON, FLA.—Bonds to the amount of $30,000 have been voted to purchase the local light and water plants.

TAMPA, FLA.—Plans are being prepared for the installation of an electric plant in the Tampa Bay Hotel.

ATLANTA, GA.—The Board of County Commissioners has granted the Central Georgia Pwr. Co. a franchise to erect transmission lines along the county roads. The company proposes to supply electricity in Atlanta and the county communities, among which is Lakewood Heights.

MACON, GA.—The Macon Ry. & Lt. Co. has appropriated $219,000 for improvements, of which $10,000 will be used for extensions of electric-light system, $10,000 for building substation, $15,910 for double-tracking and rebuilding tracks. J. T. Nyhan is general manager.

McDONOUGH, GA.—The City Council has granted a 50-year franchise to J. G. Smith to install an electric-light plant. Work will begin immediately on construction of a dam across Cotton River, about 7 miles from McDonough.

BOISE, IDAHO.—Contracts for the construction of a power plant and concrete dam across the Snake River at Crane Falls have been awarded by the Crane Falls Pwr. & Irrig. Co.; also for constructing pumping stations and irrigation canals in the Gem irrigation district. The cost of the work will aggregate about $1,000,000.

BURLEY, IDAHO.—The Village Trustees have granted Albert Ploeger a 50-year franchise for an electric-railway system.

EMMETT, IDAHO.—The Idaho-Oregon Lt. & Pwr. Co. is planning to construct a hydroelectric power plant in the Black Canyon, on Payette River, near Emmett, at a cost of about $250,000.

KELLOGG, IDAHO.—The Stewart Mining Co. contemplates the construction of a motor tramway line from its property to connect with the lines of the Oregon-Washington R. R. & Nav. Co.

BAYLIS, ILL.—A company has been formed for the purpose of rebuilding the telephone line between Baylis and Beverly. William Funk is president.

BEMENT, ILL.—The Bement Lt. & Pwr. Co. is building an addition to its electric plant to provide space for electrical machinery for the city water-works system.

BOWEN, ILL.—The plant of the Bowen El. Co. was destroyed by fire recently, causing a loss of about $5,000.

CAIRO, ILL.—The Cairo El. & Trac. Co. will erect an addition to its power house, 80 x 60 ft., and will install electric generating machinery to double the output of the plant. The cost of the work is estimated at $60,000.

CARBON CLIFF, ILL.—The Village Board is considering the question of establishing a municipal electric-light plant, to cost about $1,500. The plant will provide for 30 street lamps and about 250 incandescent lamps for residences.

HILLSBORO, ILL.—The Hillsboro El. Lt. & Pwr. Co. is planning to erect a transmission line from Hillsboro to Taylor Springs, a distance of 2 miles. J. J. Frey is general manager.

HILLVIEW, ILL.—The Village Board has granted a 20-year franchise to B. H. Adams to operate an electric-light plant here.

NAUVOO, ILL.—The Keokuk, Nauvoo & Fort Madison El. Ry. Co. is contemplating the construction of an electric railway from Keokuk to Fort Madison, Ia., with branches to the towns of Nauvoo and Carthage. The company is capitalized at $650,000 and the incorporators are: W. H. Fisher, C. H. Petsch, F. M. Catlin, E. J. Meier and W. P. Cauby.

SPRINGFIELD, ILL.—The Springfield Pleasure Driveway and Park District has decided to install an ornamental electric-lighting system on South Grand Avenue Boulevard, at a cost of $7,773.

BROOKVILLE, IND.—The electric plant of the Brookville El. Co. was damaged by fire recently, causing a loss of about $5,000. John W. Brockman is owner and manager.

FORT WAYNE, IND.—The Fort Wayne & Northern Indiana Trac. Co. has submitted bids to supply electricity to the towns of Chalmers, Brookston and Battle Ground. The company offers to furnish 23 street lamps at $30 per lamp per year and electricity for lamps at 10 cents per kw-hour and for motors at 7 cents per kw-hour. Energy will be taken from the high-tension wires either at Buck Creek or Delphi.

NEW ALBANY, IND.—Steps have been taken toward establishing an ornamental street-lighting system in the shopping district. J. A. Kraft, Charles M. Zink and Otto Sauer are members of the committee appointed to take charge of the work.

CHARLES CITY, IA.—The power house of the Charles City Western Ry. Co. was destroyed by fire on Jan. 9, causing a loss of about $10,000.

COLUMBUS JUNCTION, IA.—At an election held recently the proposition to grant a franchise for the installation of an electric-light system was carried. C. A. Archer, of Mount Pleasant, and E. N. Miller, of Colorado, will each submit franchise propositions to the City Council.

LEIGHTON, IA.—Negotiations are under way between Henry Rhynsburger, of Pella, and the Council relative to an electric franchise here.

MAQUOKETA, IA.—The City Council has granted J. Frank Barnes a franchise to install an electric-light plant here.

ORANGE CITY, IA.—F. W. Michel contemplates the installation of an electric-light plant here.

LECOMPTON, KAN.—The City Council has awarded contract to the Charles A. Strelinger Company, of Detroit, Mich., to install an electric-light plant, at $2,600.

WATERVILLE, KAN.—The City Council has awarded the contract for construction of electric-light plant and water-works system to the Des Moines Bridge & Iron Co., of Des Moines, Ia., for $27,976.

BURNSIDE, KY.—The Cumberland El. Lt., Ht. & Pwr. Co. has purchased the water rights at Cumberland Falls, a short distance above Burnside, which it proposes to utilize to generate electricity for transmission to Frankfort, Lexington, Louisville and intervening towns.

EMINENCE, KY.—Steps have been taken toward the installation of an ornamental street-lighting system in the business section. The Eminence El. Lt. Co. has agreed to take charge of the erection and maintenance of the lamp-standards.

LEXINGTON, KY.—The Lexington Utilities Co. is considering the extension of electric trunk lines for several miles along the Pythian and Paris pikes out of Lexington.

MURRAY, KY.—Work will soon begin on the installation of a municipal electric-light plant here, the Kentucky Court of Appeals having decided that the bond issue for this purpose is valid.

NEW IBERIA, LA.—F. W. Crosby, president of the Southwestern Trac. & Pwr. Co., has been authorized to carry to completion the plans for the construction of two power houses, electric railways, etc., in the Bayou Teche country from Lafayette to Berwick Bay. The entire project will cost about $2,500,000. Work will begin immediately on the railway between New Iberia and Jeanerette, which will cost from $200,000 to $300,000.

BOWDOINHAM, MAINE.—Investigations have been made with a view of establishing an electric-light plant here.

LEWISTON, MAINE.—As soon as improvements to the municipal electric-light plant are completed extensions will be made to the street-lighting system. It is proposed to install more of the "gooseneck" tungsten lamps and cluster lamps.

PHILLIPS LAKE, MAINE.—Plans are being considered by J. Fred Webster, of Brookline, Mass., for the installation of an electric plant at Phillips Lake to supply electricity to operate a mill for cutting pulp and cord wood. Phillips Lake has not a post office.

BOSTON, MASS.—The New England Investment & Security Co., controlled by the New York, New Haven & Hartford R. R. Co., has filed a petition and bill with the clerk of the Legislature providing for the incorporation of a new company under the name of the Worcester, Springfield & Berkshire St. Ry. Co., to take over the electric railways owned by the Investment company west of Worcester. The bill also provides for the construction of new railways in the Berkshires.

FITCHBURG, MASS.—Plans have been prepared for the installation of an electric-lighting system in the county court house.

LOWELL, MASS.—Negotiations are under way between the city officials and the Lowell El. Lt. Corpn. relative to the installation of an ornamental street-lighting system in the business district.

LYNN, MASS.—Plans for the proposed ornamental street-lighting system have been submitted to the Council which call for the installation of 101 street lamps in the central section. The cost of installing the lamps, which is estimated at $12,000, is to be paid by the Board of Trade. The city is asked to pay for electricity to maintain the lamps. It is also proposed to improve the lighting system in the outskirts of the city.

MERRIMAC, MASS.—A proposition has been submitted to the electric light and water commissioners by H. T. Sands, manager of the Haverhill El. Co., offering to supply electricity to the town and to private consumers for lamps and motors for a term of 5 years at 2½ cents per kw-hour.

MILTON, MASS.—Two extensions to the street-lighting system, each involving a large number of lamps, are under consideration by the village officials.

NORTH ATTLEBORO, MASS.—The municipal electric-light system will be extended to Oldtown if sufficient patronage is guaranteed. W. A. Plattner is manager of the municipal plant.

TAUNTON, MASS.—The residents of the North End have petitioned the Council for an extension of the electric-light system, to include West Britannia Street and portions of the ward which at present are without electric-lighting service.

WESTON, MASS.—The control of the Weston El. Lt. Co. has been taken over by Charles L. Edgar, president of the Edison El. Illg. Co., of Boston. The company is capitalized at $30,000 and supplies electricity in Weston, Sudbury and Wayland.

WORCESTER, MASS.—Tentative plans have been completed by the Worcester Con. St. Ry. Co. for extensions and improvements to its system in the city of Worcester and Worcester County, to cost about $2,500,000. The proposed work will include a 25-mile electric railway through Paxton, Rutland, Coldbrook and Barre to Petersham, to cost about $1,000,000, and an expenditure of $500,000 on the Milburn power station to provide sufficient power for all the Worcester Consolidated railways and other lines of the New England Investment & Security Co. connecting with the Consolidated lines, and it depends upon the action of the Legislature on the petition of the New England Investment & Security Co. providing for the incorporation of a new company to take over the electric railways owned by the company west of Worcester. J. T. Harmer is president of the New England Investment Co.

GLADWIN, MICH.—The Consolidated Lt. & Pwr. Co. will erect a transmission line from Gladwin to Clare at once. The company will supply electricity to operate the four mills, two elevators and a printing office. A 24-hour service will be furnished. Electricity for operating the system will be supplied from the Mt. Pleasant plant as soon as completed. J. L. Hudson, C. S. Abbott and Mr. Tannehill, of Detroit, are interested.

KALAMAZOO, MICH.—The special lighting committee appointed by Mayor Farrell will recommend in its report the erection of 300 ornamental lamp standards carrying tungsten lamps. It will also urge that all wires be placed under ground.

BIWABIK, MINN.—The St. Louis River Hydro-Electric Co. will soon submit a proposition to the Village Councils of Aurora, Biwabik and McKinley to furnish electricity. D. A. Reed and others are interested.

KERKHOVEN, MINN.—The installation of an electric-light plant in Kerkhoven is under consideration.

LUVERNE, MINN.—The Northwestern Tel. Exchange Co., of Minneapolis, has purchased the exchange in Luverne and all its lines in Rock County of the Luverne Tel. Co.

RED WING, MINN.—The Board of Water Commissioners is contemplating equipping the water-works pumping station for electrical operation.

THIEF RIVER FALLS, MINN.—Plans are being considered to erect a transmission line from Thief River Falls to Neptune and Torgerson, via Kratka, High Landing and Erie.

JENNINGS, MO.—A franchise has been granted by the County Court to David P. Leahy and associates to erect transmission lines in Jennings.

SPRINGFIELD, MO.—Improvements costing about $250,000 are being considered by the Federal Lt. & Trac. Co. to the local electric, traction and gas systems. W. A. Bixby is local manager.

LINCOLN, NEB.—The State Railway Commission has granted the Lincoln Tel. & Teleg. Co. permission to issue $3,350,000 in capital stock for the purchase of the Nebraska Bell Telephone properties south of Platte.

FALLON, NEV.—The Department of the Interior has authorized a contract between the government and the city of Fallon for electricity generated at the Lahontan Dam. Work will begin at once on the erection of the transmission line.

GARDNERVILLE, NEV.—The United Farmers' Tel. & Teleg. Co. has applied to the Board of County Commissioners for a franchise to erect telephone lines in certain sections of Douglas County.

GOLDFIELD, NEV.—Plans are being prepared for the installation of an electric hoist at the Silver Pick Mine.

MANHATTAN, NEV.—Electrical operating machinery will be installed in the new gold-milling plants to be erected by the Associated Milling Co. and the War Eagle Mining Co. at Manhattan.

FRANKLIN, N. H.—The Franklin Lt. & Pwr. Co. has been awarded a five-year contract for street lighting, under the terms of which the company is to supply 1200-cp arc lamps at $65 each per year, 32-cp incandescent lamps at $15 each per year, 60-cp lamps at $18 each, 100-cp at $22.50, and 200-cp at $35 each per year. The contract provides that the arc lamps can be exchanged for tungsten lamps where desired.

MILFORD, N. H.—The Public Service Commission has authorized the Milford Lt. & Pwr. Co. to issue $16,000 in capital stock, the proceeds to be used for additions and improvements.

FREEHOLD, N. J.—The Board of Public Utility Commissioners has approved an issue of $5,700 of capital stock of the Freehold & Jamesburg Lt. Co., the proceeds to be used for the purchase of the lighting plant.

MILLVILLE, N. J.—The City Council has appointed a committee to investigate the cost of establishing and maintaining a municipal electric-light plant.

TOTOWA, N. J.—Mayor Walter R. Hudson in his annual message to the Council recommends the installation of an electric-light plant to be controlled by the county and the various municipalities in order to secure better lighting facilities for the public roads. Totowa has not a post office.

CIMARRON, N. M.—Application has been made to the City Council by Henry M. Shaw, of Las Vegas, for a franchise to build and operate an electric-light plant here.

ROSWELL, N. M.—The City Council is considering establishing a municipal electric-light plant in connection with the water-works system. The installation of an ornamental street-lighting system on Main Street is also under consideration.

WHITE OAKS, N. M.—The Wild Cat Leasing Co. has acquired the mining and electric plant of the Vera Cruz Mining Co., near Nogal, which it will remove at once to its property. The electric plant, it is understood, will be enlarged to provide electricity for the entire town.

CATSKILL, N. Y.—The Public Service Commission, Second District, has granted the Catskill Trac. Co. permission to extend its electric railway from Leeds to Cairo, a distance of about 7 miles.

NEW YORK, N. Y.—The Public Service Commission has granted the Interborough Railway Company permission to construct and operate a street railway through 145th Street from Lenox Avenue to the easterly side of Broadway.

PITTSFORD, N. Y.—A petition has been presented to the Town Board by the taxpayers on the Rochester-Pittsford road to form a lighting district for the purpose of lighting that thoroughfare. Tentative arrangements have already been made with the Eastern Monroe El. Lt. & Gas Co., of East Rochester, to supply electricity for 80 lamps that will be required.

PULASKI, N. Y.—The Town Board of Richland has granted the Pulaski El. Lt. Co. a franchise to erect transmission lines to supply electricity in that village. The company is also planning to extend its system to furnish electricity for lamps, heat and motors in Altmar, Central Square, Hannibal, Mexico and Parrish, Albion, Granby, Hastings, Oswego Town, Orwell, Palermo, Redfield, Schroeppel and Volney. It is understood that the Pulaski company is interested in the development of the Salmon River, which will involve an expenditure of $4,000,000.

ROCHESTER, N. Y.—The contract for electrical equipment in buildings 1, 2 and 3 at Exposition Park has been awarded to the Fish-Horton Co., at $4,496.

TROY, N. Y.—The Burden Iron Company is contemplating the installation of an electric generating plant, the cost not to exceed $25,000.

HICKORY, N. C.—M. E. Thorton, president of the Water-Pwr. El. Co., writes that he has made arrangements for financing his hydro-electric development on the Catawba River.

JAMESTOWN, N. D.—The property of the Central Tel. Co., of Stutsman County, was sold at auction recently to the North Dakota Independent Tel. Co., of Fargo, at $8,000.

ALLIANCE, OHIO.—Mayor Edward P. Speidel in his annual message to the City Council advocates municipal ownership of the electric-light and gas plants.

CLEVELAND, OHIO.—Mayor Baker has engaged Frederick W. Ballard, manager of the engineering and construction department of the Sherwin-Williams Company, of Cleveland, Ohio, as constructing engineer of the proposed $2,000,000 municipal electric-light plant. A. B. Du Pont was appointed as consulting engineer and W. J. Critchley as chief draftsman. Work will begin immediately on preparing plans.

COLUMBUS, OHIO.—The Columbus, Urbana & Western El. Ry. Co. has petitioned the Public Utilities Commission for permission to issue $5,500,000 in bonds and $500,000 in capital stock.

COLUMBUS, OHIO.—The City Council has adopted the resolution authorizing that a special election be held to vote on the proposition to issue $265,000 to establish a municipal electric-light plant.

EDGERTON, OHIO.—E. A. Geauque, owner of the electric-light plant at Edgerton, has been granted a franchise to supply electricity in Blakeslee. Work will begin on the erection of the transmission line as soon as the weather will permit. It is expected to extend the service to Melbern soon.

MARYSVILLE, OHIO.—The Marysville Lt. & Wtr. Co. is planning to change its system from direct current to alternating current in the outlying districts.

MUSKOGEE, OKLA.—The City Council has decided to make investigations as to the feasibility of acquiring lands adjacent to the proposed dam site across the Grand River, to be used for the site of the proposed electric plant.

BAKER CITY, ORE.—Work will soon begin on the construction of the municipal electric-light plant, for which bonds to the amount of $45,000 were voted.

BAY CITY, ORE.—The Portland & West Coast Ry. Co. has filed application for a franchise in Bay City. The company has acquired a site and is said to be planning to construct a hydroelectric plant to operate its proposed system through Sheridan, Willamina, Bentley and Tillammok, where franchises have been secured.

DUFUR, ORE.—Plans are being considered by the City Council for extensions to the municipal electric-lighting system.

HILLSBORO, ORE.—The Martin & Forbes Co. has been granted a franchise to erect a telephone line along the Base Line road to Haynes Station.

KLAMATH FALLS, ORE.—The Klamath Falls Lt. & Wtr. Co. is negotiating with the City Council for the installation of a tungsten street-lighting system to replace the present carbon lamps. The cost of the work is estimated at $6,000.

PORTLAND, ORE.—The Mount Hood Ry. & Pwr. Co. is planning to extend its railway from Russellville to the South Mount Tabor district.

PORTLAND, ORE.—The Portland Ry., Lt. & Pwr. Co. has awarded a contract to the Allis-Chalmers Co. for one 7500-kw horizontal, direct-connected steam turbine to be installed in station "E" in North Portland. New boilers will also be installed.

PANAMA.—Bids will be received until Feb. 15 at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., for furnishing lifting trusses, lifting mechanism, electrical equipment, signals, etc., for the construction and erection of a single-track, single-leaf bascule, same to be installed by the commission on the 103½-ft. steel girders now on hand at bridge 140, relocated line, Panama Railroad.

EASTON, PA.—The Eastern Pennsylvania Pwr. Co. has purchased the holdings of the Easton Gas & Elec. Co. in Easton and Phillipsburg, N. J.

INDIANA, PA.—The property of the Indiana Provision Co. has been purchased by H. J. Walbridge & Co., of New York, N. Y., for $200,000.

JOHNSTOWN, PA.—Plans are being considered by the Citizens' Lt., Ht. & Pwr. Co. for the erection of a system of high-tension transmission lines radiating from Johnstown, which will benefit the coal and other industries in this territory.

PITTSBURGH, PA.—The Pennsylvania Lt. & Pwr. Co. has increased its capital stock from $630,000 to $1,000,000.

PITTSBURGH, PA.—Mayor Magee has vetoed the ordinance passed recently by the City Council providing for an extension of the franchise of the Pennsylvania Lt., Ht. & Pwr. Co., which now operates in the North Side wards, throughout the city.

PITTSBURGH, PA.—Proposals will be received at the office of the city controller, municipal hall, Pittsburgh, Pa., until Jan. 26 for the following work: Inspection and testing of boilers and appurtenances for Aspinwall pumping station, contract No. 4-G; electric traveling cranes, electric generating equipment and appurtenances for Aspinwall pumping station, contract No. 4-H; discharge chambers and cage plates for pump No. 5 in Howard Street pumping station and suction cage plate for 12 MGD pumping engine in Montrose pumping station. Copies of contract and specifications for traveling crane and electric generating equipment can be obtained at the office of the Department of Public Works upon deposit of $10 for each copy. Joseph G. Armstrong is director of Department of Public Works.

SHOHOLA, PA.—The application of the Shohola Falls Hydro-El.

Co. for permission to build a plant in Shohola Township has been approved by the State Water Supply Commission.

SUNBURY, PA.—The Northumberland County Trac. Co., the Sunbury & Selinsgrove El. Ry. Co. and the Sunbury-Lewisburg & Milton Ry. Co. have been consolidated. Extensions are contemplated by the consolidated company extending to Harrisburg on the south, Shamokin on the east and northward to Williamsport.

SUMTER, S. C.—The Sumter Ice, Lt. & Pwr. Co. is planning improvements to its system, involving an expenditure of about $25,000, and will include the installation of 750-hp turbine direct-connected with electric generator.

ELK POINT, S. D.—Application has been made to the City Council for a franchise to construct an electric-light plant here. The petitioners agree to light the streets of Elk Point for five years for $50 per month and also to furnish power to pump the city water at a low rate. P. W. Ellis, Ova J. Henkin and Thomas Dyer are interested.

HITCHCOCK, S. D.—The Council is considering the question of establishing an electric-light plant here.

PIERRE, S. D.—The Davenport, Iowa City & Western Trac. Co. has applied for a charter to build an electric railway from Davenport to Iowa City, a distance of 70 miles, with a branch to Tipton. The company is capitalized at $1,600,000, and the directors are: C. E. Coon, of Omaha, Neb.; Stephen Bradley, G. W. Koentz, of Iowa City, Ia., and Tillman Todd, of Springdale, Ia.

SIOUX FALLS, S. D.—Plans have been submitted for the installation of 53 three-lamp standards, covering an area of 1 mile, at a cost of about $5,000.

MANCHESTER, TENN.—The Duck River Lt. & Pwr. Co. has awarded a contract to the Nashville Bridge Co. for furnishing a steel flume and penstock to take the place of the wooden flume on the Manchester company's property recently destroyed by fire.

McMINNVILLE, TENN.—Arrangements have been made by the Great Falls Pwr. Co. to build a 100-ft. dam across Caney Fork River at Falls City, in connection with a large hydroelectric power development. A. J. Dyer is president and general manager.

ROGERSVILLE, TENN.—The property of the Rogersville El. Co. has been purchased by W. D. Harmon and McDonald Brothers, of Rogersville. The new owners propose to install an entire new plant, using the present equipment for auxiliary purposes. A 24-hour service is promised.

BEEVILLE, TEX.—The Beeville Mfg. Co. is planning to install a 120-kw alternating-current generator and a 20-ton ice plant, bids for which will be received until Feb. 1. Bonds to the amount of $18,000 have been voted to purchase and improve water-works system and electric-light plant.

BRENHAM, TEX.—The construction of an electric railway from Brenham to La Grange, a distance of 32 miles, is under consideration by a syndicate of Northern capitalists. The Brenham Commercial Club is interested.

COLUMBUS, TEX.—A franchise has been granted to E. A. Hutchins, of Columbus, and associates to construct a 5000-hp hydroelectric power plant, at a cost of about $150,000.

DALLAS, TEX.—The Dallas Southern Trac. Co. has been granted a franchise to construct an electric railway on certain streets of the city. The company has filed a mortgage and trust deed for $2,000,000, and is a subsidiary of the Stone & Webster Engineering Co.

DECATUR, TEX.—At an election held recently bonds to the amount of $18,000 were voted to purchase the electric-light plant and water-works system. Work will begin at once on repairing the plants which were destroyed by fire last fall.

GREENVILLE, TEX.—The Greenville & Blue Ridge Interurban Ry. Co. is planning to build an electric railway from Greenville to Blue Ridge, a distance of 21 miles, for which surveys have been made.

MENARD, TEX.—The installation of an electric-light plant and ice plant is under consideration.

PORT LAVACA, TEX.—A franchise has been granted to W. E. Shell & Co. to construct an electric-light plant.

QUANAH, TEX.—A company has been organized to construct a telephone system. Arrangements have been made to acquire the rural line to Damsite and vicinity. A common-battery system will be installed and wires placed underground in the fire limits. J. L. Tullis, W. T. Perkins and F. B. Kirby are interested in the project.

LOGAN, UTAH.—The Logan Rapid Tran. Co. has applied for a 50-year franchise to construct and operate railways in certain portions of Cache County.

PROVO, UTAH.—The Knight Pwr. Co. and the Utah County Lt. & Pwr. Co. have consolidated under the name of the Knight Con. Lt. & Pwr. Co. with a capital stock of $2,000,000. Jesse Knight will be president of the new company.

BRANDON, VT.—The Public Service Commission has authorized the Neshobe El. Co. to increase its capital stock by $10,000, the proceeds to be used to pay outstanding indebtedness and for improvements and extensions to its plant.

BRISTOL, VT.—The Lake Dunmore Pwr. & Trac. Co. has been granted permission by the Public Service Commission to issue $25,000 in bonds, the proceeds to be used for payment of existing indebtedness and for improvements and extensions to its system.

HARDWICK, VT.—The village electric power plant at Potterville was recently destroyed by fire.

POULTNEY, VT.—The Rutland Ry., Lt. & Pwr. Co. is negotiating for a contract to supply electricity for a new mill which is to be erected in the North Poultney district by the Staso Mills. About 200 hp will be required. The line will be extended to Granville, N. Y., by spring.

ST. JOHNSBURY, VT.—The St. Johnsbury El. Co. has been authorized by the Public Service Commission to increase its capital stock by $25,000, the proceeds to be used for building a new power plant and for payment of existing indebtedness.

RAYMOND, WASH.—A company has been organized by Jay D. Crary and Theodore B. Bruner to build and operate an electric railway between Raymond and South Bend, a distance of 6 miles. The company is capitalized at $200,000.

SEATTLE, WASH.—The Colonial Oil Co., recently incorporated with a capital stock of $12,500,000, proposes to establish electric and gas-generating plants as well as to operate oil properties. J. M. Hosom, B. H. Silver and C. A. Thurston, all of Seattle, are interested.

WEYAUWEGA, WIS.—The local electric-light plant, water power, a flour mill, elevator and other buildings have been purchased by David E. Reese for $23,100.

OSOYOOS, B. C., CAN.—Bruce White contemplates the construction of a hydroelectric power plant at the falls of Little Okanagan Lake.

VERNON, B. C., CAN.—The power plant of the Coteau Power Company is reported to have been destroyed by fire. The plant will be rebuilt immediately.

FOREST, ONT., CAN.—The ratepayers have voted in favor of municipal ownership of the electric-light plant.

CANANEA, SONORA, MEX.—L. Kelly, operating mining properties on the Catalina lease, is planning to install an electric hoisting plant.

CHIHUAHUA, MEX.—Ovidio Vera has applied for a 20-year franchise to erect and operate telephone lines from Temosachio to Madera, a distance of about 35 miles.

MEXICO CITY, MEX.—Plans are being considered by Dr. F. S. Pearson, of New York, and associates for the construction of an electric railway from here to the summit of Mount Popocatepetl. The railway will be a branch of the proposed road to be built from this city to Puebla, 160 miles in length.

Business Notes.

THE RIDGWAY DYNAMO & ENGINE COMPANY, Ridgway, Pa., announces the opening on Jan. 1, 1912, of a new district office in room No. 1417, Oliver Building, Pittsburgh. Mr. J. F. Rodgers, who is a native of Pittsburgh and enjoys a wide acquaintance among the mine, mill and manufacturing interests of the city and vicinity, has been secured as local manager.

VULCANIZED PRODUCTS COMPANY.—Because of a slight confusion in names, the Staunton Dielectrite Rubber Company, manufacturer of molded insulation for high and low-tension and rubber-compound products, Muskegon, Mich., has changed its name to the Vulcanized Products Company, and its dielectritic material, formerly called "Dielectrite," will be renamed "Gohmak."

ADDITIONS TO CROCKER-WHEELER STAFF.—The organization of the Crocker-Wheeler Company has recently been strengthened by the addition of George W. Fowler, W. J. Warder, Jr., and A. K. Selden, Jr. Mr. Fowler and Mr. Warder have joined the company's sales department, and Mr. Selden enters its engineering department. Mr. Fowler has been for many years the sales manager of the Garwood Electric Company. Mr. Warder was formerly chief engineer and superintendent of Roth Brothers in Chicago, and later was connected with the Westinghouse Electric & Manufacturing Company at East Pittsburgh. Mr. A. K. Selden, Jr., has for some years been in charge of the design of the interpole adjustable-speed motors manufactured by the Electro-Dynamic Company.

FIRE AT ST. LOUIS CARBON FACTORY.—A fire at the plant of the American Carbon & Battery Company, whose offices are located at 509 Olive Street, St. Louis, Mo., destroyed one of the main buildings. The loss is estimated at between $75,000 and $100,000 and was covered by insurance. A great deal of machinery was destroyed, but only a small amount of the large stock of carbon-brush material and general carbon products was destroyed, as most of this was in a building adjoining the one that burned. Enough finished and semi-finished material is in stock to supply the trade until the plant is rebuilt. Temporary quarters have been arranged and all orders are being filled promptly. The battery plant was not injured in any way and work has gone ahead without any delay in this department. The carbon plant will be rebuilt at once and will, it is announced, be by far the most complete and up-to-date plant of its kind in the country. Special machinery will be put in to facilitate the manufacture of the new and improved line of motor and generator brushes that the company put on the market a short time ago, and it will continue to make the full line of standard and special carbon and graphite materials that it has always made.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JAN. 9, 1912.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,013,859. FILAMENT SUPPORT; W. R. Burrows, Newark, N. J. App. filed March 13, 1907. Spring support for metal filaments.

1,013,865. TELEPHONE SYSTEM; W. W. Dean, Chicago, Ill. App. filed July 5, 1901. Central energy exchange; busy test; supervisory signal.

1,013,904. ELECTRIC INDICATOR SYSTEM; S. R. Stone, New York, N. Y. App. filed May 3, 1909. Push-button alarm or call bell, etc., for buildings.

1,013,914. ATTACHING FILAMENTS TO LEADING WIRES; W. R. Whitney, Schenectady, N. Y. App. filed June 14, 1907. Tungsten lamp.

1,013,915. METAL-FILAMENT LAMP; W. R. Whitney, Schenectady, N. Y. App. filed Aug. 19, 1907. Prevents distortion under stress.

1,013,958. SHAPING AND MOUNTING FILAMENTS; K. Schröter, Berlin, Germany. App. filed Jan. 4, 1911. The filament is bent before mounting.

1,013,959. MECHANISM FOR CHARGING STORAGE BATTERIES; J. B. Schug, Detroit, Mich. App. filed Oct. 20, 1910. Automatic switch.

1,013,962. FILAMENT CONNECTION; F. Skaupy, Berlin, Germany. App. filed July 26, 1910. V-member.

1,013,965. FILAMENTS FOR INCANDESCENT LAMPS; C. P. Steinmetz, Schenectady, N. Y. App. filed July 28, 1905. Tantalum filament; spring supports.

1,013,972. JUNCTION BOX; W. S. Timmins, New York, N. Y. App. filed Nov. 13, 1906. For concrete floors.

1,013,990. ELECTRIC SWITCH; J. E. DuVal, Bowie, Tex. App. filed May 12, 1911. Telescoping line-wire coupling.

1,014,001. ALTERNATING-CURRENT MOTOR; H. F. Hitner, Pittsburgh, Pa. App. filed Dec. 24, 1906. Starts as a repulsion motor and changes to induction type; centrifugally distributed mercury contact.

1,014,002. APPARATUS FOR WIRELESS SIGNALING; J. L. Hogan, Jr., Brant Rock, Mass. App. filed Sept. 9, 1910. Adjustable tuning element.

1,013,962—Filament for Incandescent Lamps

1,014,025. CLIP FOR MINERS' LAMPS; G. I. Rawson and L. B. Shultz, St. Louis, Mo. App. filed Aug. 8, 1910. For attaching a lamp to a battery.

1,014,049. ART OF ELECTRICAL DISTRIBUTION; R. D. Cutler and M. F. Owens, Hartford, Conn. App. filed June 10, 1911. Automatic regulation for household use of heaters, lamps, motors, etc.

1,014,061. PROCESS OF RECOVERING COPPER FROM ITS ORES; H. K. Hess, Philadelphia, Pa. App. filed Aug. 27, 1907. Electrolysis in chromic-acid solution.

1,014,071. CURRENT COLLECTOR FOR ELECTRIC CRANES; F. C. Lemon, Milwaukee, Wis. App. filed Sept. 11, 1908. Renewal and adjustment of the contact pieces.

1,014,098. THERMAL CUT-OUT; J. Sachs, Hartford, Conn. App. filed May 5, 1908. Indicator fuse of cartridge type.

1,014,107. MAGAZINE SLOT FOR COIN-OPERATED MUSICAL INSTRUMENTS; P. Wiggen, Chicago, Ill. App. filed Feb. 21, 1910. For receiving several coins at once to release several "pieces."

1,014,108. ELECTRIC COUPLING; P. C. Wild, Rochester, N. Y. App. filed April 26, 1910. Switch for electrically operated hand tools.

1,014,125. HARMONIC RINGER; E. B. Craft, Hackensack, N. J. App. filed Jan. 21, 1910. Adjustable armature.

1,014,146. ELECTRIC BATTERY; H. Halsey, New York, N. Y. App. filed May 6, 1903. Storage battery with common tank and electrolyte for a number of couples.

1,014,151. APPARATUS FOR THE ELECTRICAL TREATMENT OF VAPORS OR GASES; W. T. Hoofnagel, Glen Ridge, N. J. App. filed Oct. 6, 1911. Electric treatment of gases under tension. Method of Patent No. 956,097.

1,014,161. ELECTRICAL HEATER; C. P. Madsen, Chicago, Ill. App. filed July 9, 1910. Grid for cooking and heating.

1,014,169. ELECTRIC-LAMP SOCKET; M. Norden, New York, N. Y. App. filed May 17, 1911. One-piece porcelain for signs, etc.

1,014,199. REFRACTORY BODY AND PROCESS FOR MAKING THE SAME; E. G. Acheson, Stamford Township, Ontario, Canada. App. filed May 27, 1909. Silicon-carbon tougher than carborundum.

1,014,207. SPARK-PLUG TESTER; A. De Clairmont, Toledo, Ohio. App. filed Nov. 28, 1910. A transparent tube with spark-gap and terminals.

1,014,208. RAILWAY SIGNALING APPARATUS; W. J. Cook, Denver, Col. App. filed Sept. 7, 1909. Semaphore block system; solenoid operated with safety lock.

1,014,210. ALTERNATING-CURRENT ELECTRIC MOTOR; W. N. Dickinson, Jr., New York, N. Y. App. filed July 3, 1906. Elevator motor with brake.

1,014,216. BRAKE-MAGNET PROTECTIVE DEVICE; E. L. Gale, Sr., Yonkers, N. Y. App. filed April 20, 1909. Fuseless signal device for alternating-current brakes for elevator motors, etc.

1,014,217. POWER TABLE FOR KITCHEN UTENSILS; J. H. Goehst and R. G. Carpenter, Chicago, Ill. App. filed April 22, 1910. Motor-driven dough mixer, cherry seeders, food grinders, etc.

1,014,220. MONOTELEPHONE RELAY; P. Heina, Paris, France. App. filed Dec. 22, 1910. Detail improvements over Patent No. 930,753.

1,014,234. MECHANICAL REVERSING AND ACCELERATING SWITCH; D. Larson, Yonkers, N. Y. App. filed March 5, 1909. Polyphase induction motor; elevator system.

1,014,253. COMMUTATOR; M. Pfatischer, Bayonne, N. J. App. filed July 10, 1907. Composite bar of copper and steel.

1,014,257. VIBRATION ABSORBER FOR ALTERNATING-CURRENT-MAGNET ARMATURES; C. L. Rosenquist, Yonkers, N. Y. App. filed Aug. 21, 1908. Counteracting vibrations by an electrically connected weight.

1,014,268. COMBINED TRANSMITTER AND RECEIVER; W. B. Thompson, North Conway, N. H. App. filed June 20, 1911. For house and factory telephones.

1,014,300. MULTI-THROW SWITCH; G. W. Hart, West Hartford, Conn. App. filed March 3, 1911. Laterally displaced contacts and a selective switch arm for remote control.

1,014,354. SYSTEM OF ELECTRICAL DISTRIBUTION; J. L. Woodbridge, Philadelphia, Pa. App. filed Dec. 6, 1909. Two independent supply circuits, two independent consumption circuits and a compensating storage battery.

1,014,355. ELECTRICAL SYSTEM OF DISTRIBUTION; J. L. Woodbridge, Philadelphia, Pa. App. filed June 16, 1911. Variable-speed dynamo with a Wheatstone-bridge connection to the consumption circuit.

1,014,373. SYSTEM OF ALTERNATING-CURRENT REGULATION; J. Bijur, New York, N. Y. App. filed Oct. 16, 1906. Flywheel compensation for main and auxiliary alternators.

1,014,395. SYSTEM OF ELECTRICAL DISTRIBUTION; R. C. Hill, Philadelphia, Pa. App. filed March 18, 1910. Variable-speed dynamo regulation.

1,014,425. MANUFACTURE OF STEEL; W. R. Walker, New York, N. Y. App. filed June 18, 1909. Bessemer process with final electric-furnace treatment.

1,014,437. ELECTRIC HEATER; C. O. Bastian, London, England. App. filed Feb. 4, 1910. Quartz radiating tube.

1,014,443. MECHANICAL MOVEMENT AND ELECTRIC-LIGHT SOCKET; T. A. C. Both, New York, N. Y. App. filed Aug. 2, 1911. Switch with reversible driver.

1,014,455. MAGNETICALLY CONTROLLED SWITCHING APPARATUS; S. B. Condit, Jr., Brookline, Mass. App. filed Jan. 5, 1911. Magnetic locking device.

1,014,461. ELECTRIC GAS LIGHTER; H. D. Grinnell, Pittsfield, Mass. App. filed Dec. 7, 1910. Spark-gap terminals attached to the burner tip.

1,014,466. RECTIFIER; R. A. Hamann, Omaha, Neb. App. filed Feb. 17, 1909. Polarized relay with alternating current.

1,014,488. CABLE DUPLEX REPEATING SYSTEM; I. Kitsee, Philadelphia, Pa. App. filed Nov. 10, 1908. Has a transformer and condenser; no "artificial line."

1,014,492. TELEPHONE CABINET OR HOOD; G. W. Lancaster, Richmond, Va. App. filed Dec. 7, 1910. Just large enough for the head, the switch being outside.

1,014,495. RECRIPROCATING ELECTRIC MOTOR FOR DRILLS; P. L. Lincoln, Birmingham, Ala. App. filed Jan. 28, 1910. The drill rod is carried by the solenoid armature. Improvement on Patent No. 942,396.

1,014,537. ELECTRIC APPLIANCE; M. Thulin, Ephraim, Utah. App. filed April 1, 1910. Special handles for electro-medicinal treatment.

1,014,556. TRACKLESS TROLLEY; C. A. Ahl, Salem, N. J. App. filed Oct. 25, 1909. Improvements in the shoe to facilitate replacement and passing of two trolley shoes.

1,014,560. PROCESS OF ELECTROPLATING ALUMINUM AND ITS ALLOYS; E. Becker and O. Becker, Iserlohn, Germany. App. filed July 28, 1911. Hot bath of ZnCn, H_2O and NH_3; then cold bath of tartar and water, and then electroplating.

1,014,569. TROLLEY HANGER; R. O. Couch, Charleston, W. Va. App. filed June 21, 1910. Gripping means for a wire support for catenaries.

1,014,588. ELECTRICAL SIGNALING DEVICE; E. A. Fitzgerald, Highwood, Ill. App. filed Dec. 9, 1909. Contact device beside a railway track, particularly crossings.

1,014,600. ELECTRICAL RELAY; E. E. Kleinschmidt, New York, N. Y. App. filed Nov. 18, 1908. Signal device for single-track railway.

1,014,[illegible]. ELECTRIC CONTROLLER; A. C. Eastwood, Cleveland, Ohio. App. filed Sept. 22, 1910. Interlocking individual magnetically operated switches.

13,353 (Reissue). ELECTRIC-LAMP SOCKET; H. Hubbell, Bridgeport, Conn. App. filed Aug. 4, 1910. A two-part cap rotatably adjustable. (Nineteen claims). Original Patent No. 943,078, dated Dec. 14, 1909.

13,354 (Reissue). DYNAMO-ELECTRIC MACHINE; L. J. Hunt, Sandycroft, England. App. filed March 4, 1911. Induction motor with a compound-wound stator. Original Patent No. 926,192, dated June 29, 1909.